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November 3, 2004 Date	 Monica A. De La Paz

**PATENT**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re Application of:  
Wold *et al.*

Serial No.: 09/351,778

Filed: July 12, 1999

For: Replication Competent Anti-Cancer Vectors

Group Art Unit: 1632

Examiner: Priebe, Scott David

Atty. Dkt. No.: 66153-7775

**SUPPLEMENTAL BRIEF ON APPEAL**

**MS Appeal Brief-Patents**  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450



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Appellants hereby submit an original and three copies of this Supplemental Appeal Brief to the Board of Patent Appeals and Interferences in response to the Notification of Non-Compliance with 37 C.F.R. §1.192(c), dated September 9, 2004 and the final Office Action. The Notice of Appeal was filed on May 20, 2004, and received in the Patent and Trademark Office on May 24, 2004. The Appeal Brief was filed on July 28, 2004. The initial deadline for re-filing the revised appeal brief was October 9, 2004. A fee for a one-month extension of time is included herewith. Thus, this brief is timely filed.

A check for the one-month extension is enclosed. If the check is inadvertently omitted, or the amount is insufficient, or should any additional fees under 37 C.F.R. §§ 1.16 to 1.21 be required for any reason relating to the enclosed materials, or should an overpayment be included herein, the Commissioner is authorized to deduct or credit said fees from or to Fulbright & Jaworski L.L.P. Account No.: 50-1212/INGN:109US.

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#### **I. REAL PARTIES IN INTEREST**

The real parties in interest are St. Louis University (assignee), VirRx (licensee), and Introgen Therapeutics, Inc. (sublicensee).

#### **II. RELATED APPEALS AND INTERFERENCES**

There are currently no related appeals or interferences.

#### **III. STATUS OF THE CLAIMS**

The application was filed with original claims 1-27. Claims 28-108 were added during prosecution. Of these, claims 1-4, 10, 45-59, 85-96 have been previously canceled, and claims 6-9, 16-19, 23, 25-31, and 76-84, directed to non-elected species with no currently allowable generic or linking claim, stand withdrawn. Thus, claims 5, 11-15, 20-22, 24, 32-44, 60-75, and

97-108 are pending. Of these, claims 11-15, 20-22, 24, 32-44, 60-75, and 97-108 are subject to the present appeal, with the subject matter of claims 14-15, 24, 62, 63, 67, 70-71 and 100 being free of the prior art. A copy of the appealed claims is attached as Appendix 1.

#### **IV. STATUS OF AMENDMENTS**

No amendments were sought to the pending claims following final rejection.

#### **V. SUMMARY OF THE INVENTION**

The present invention is directed generally to the use of a special type of replication-competent “oncolytic” adenoviruses in the treatment of cancer. Specification, page 1, lines 8-10; and page 10, line 35 through page 11, line 2.<sup>1</sup> The oncolytic adenoviruses of the present invention are special in terms of their expression of the ADP gene. Specification, page 5, lines 16-31. The ADP gene (which stands for “adenovirus death protein”) is the gene discovered by the present inventors to promote oncolysis of cancer cells that are infected with these special adenoviruses. Specification, page 5, lines 16-31. The claims can generally be divided into two categories. One category, the “ADP overexpressing” adenovirus claims, are exemplified by claims 13 and 101, and claims depending therefrom:

13. A method for treating cancer in an animal having a tumor comprising administering to the tumor an adenovirus vector wherein said adenovirus vector is replication-competent in neoplastic cells and overexpresses an adenovirus death protein (ADP), wherein overexpression is defined as overexpression relative to *dl309*.

101. A method for treating cancer in an animal having a tumor, the method comprising administering to the tumor an adenovirus vector wherein said adenovirus vector is replication-competent in neoplastic cells and overexpresses an adenovirus death protein (ADP).

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<sup>1</sup> Appellants note that citations to the Specification identify support for the claimed invention. However, such citations in no way constitute the only support, as other support in the Specification can be found and relied upon, if necessary.

The second category of claims are not *per se* limited to “ADP overexpression” and are directed to adenoviruses defined in terms of structural instead of functional limitations. This category is exemplified by claim 60 and claims depending therefrom:

60. A method for treating cancer in an animal having a tumor, the method comprising administering to the tumor an adenovirus vector that is replication-competent in neoplastic cells and expresses an adenovirus death protein (ADP), wherein:

- a) the ADP is expressed from an ADP coding sequence positioned under the control of a promoter other than the endogenous promoters for ADP;
- b) the adenovirus vector comprises a deletion in the E3 region that removes a splice site for an E3 mRNA;
- c) the ADP is expressed from an ADP coding sequence flanked by a pre-mRNA splicing and cleavage/polyadenylation signal other than the pre-mRNA splicing and cleavage/polyadenylation signal normally associated with the ADP gene, and/or
- d) the ADP is expressed from an ADP coding sequence that is positioned downstream of the coding sequence for another adenovirus mRNA, together with a sequence on the 5’ side of the ADP coding sequence that allows for internal initiation of translation of ADP.

Lastly, claim 102 specifies ADP overexpression that is achieved by one of the foregoing structural limitations:

102. A method for treating cancer in an animal having a tumor, the method comprising administering to the tumor an adenovirus vector wherein said adenovirus vector is replication-competent in neoplastic cells ***and overexpresses an adenovirus death protein (ADP)***, wherein overexpression is effected by one of more of the following modifications:

- a) the ADP is expressed from an ADP coding sequence positioned under the control of a promoter other than the endogenous promoters for ADP;
- b) the adenovirus vector comprises a deletion in the E3 region that removes a splice site for an E3 mRNA;

- c) the ADP is expressed from an ADP coding sequence flanked by a pre-mRNA splicing and cleavage/polyadenylation signal other than the pre-mRNA splicing and cleavage/polyadenylation signal normally associated with the ADP gene, and/or
- d) the ADP is expressed from an ADP coding sequence that is positioned downstream of the coding sequence for another adenovirus mRNA, together with a sequence on the 5' side of the ADP coding sequence that allows for internal initiation of translation of ADP.

The specification describes a series of exemplary adenoviruses that overexpress ADP, including the KD series (KD1, KD2, KD3) and the GZ series (GZ1, GZ3) and further describes the use of these vectors in the treatment of human cancer as exemplified through accepted animal models [Specification, Examples 1 – 4 (page 20, line 31 through page 29, line 11), FIGS. 1-9]. The KD series include mutations in their E1 regions that appear to limit their replication to cancer cells, whereas the GZ series do not have such limitations [Specification, Examples 1 – 8 (page 20, line 31 through page 40, line 29)]. All of these vectors have demonstrated significant if not surprising antitumor oncolytic efficacy [Specification, Examples 2, 4, 7, and 8, page 25, line 6 through page 37, line 33]. One such vector, designated INGN007 (i.e., GZ3), is currently in preclinical development by Introgen Therapeutics, Inc. and is expected to be in the clinic in the very near future.

## **VI. ISSUES ON APPEAL**

This appeal presents the following issues:

- a) Whether the subject matter of the appealed claims is adequately described in the subject specification as required by 35 U.S.C. §112, first paragraph;
- b) Whether the claims 101-102 are indefinite under 35 U.S.C. §112, second paragraph;

- c) Whether the subject matter of claims 10-13, 32-44, 60, 61, 68, 69, 72-75, 97-99 and 101-108 is anticipated by Henderson *et al.* (“Henderson”; Exhibit 1) or Little *et al.* (“Little”; Exhibit 2) under 35 U.S.C. §102(e);
- d) Whether the subject matter of claims 13, 20-22, 60 and 64-66 is obvious under 35 U.S.C. §103 over the combination of Henderson or Little in light of Freytag (Exhibit 3).

## **VII. GROUPING OF THE CLAIMS**

With respect to all of the rejections, the claims shall not stand or fall together and shall be considered separately as set forth below. For example, in addition to the groupings set forth by the Examiner, claim 13 and claims depending therefrom shall be considered separately from claim 60 and claims depending therefrom. Furthermore, within these groupings there are additional claims that are argued separately, including but not limited to claims 68, 70, 72 (which break out individual structural features a) – d) of claim 60), claims 20, 22, 64, 66, (which specify combination therapy with radiation or chemotherapy), claim 101 (ADP overexpression), claim 102 (which specifies ADP overexpression as a function of specified structural limitations), claims 103-106 (which specify methods for measuring overexpression), and claims 107, 108 (which specify human therapy).

## **VIII. ARGUMENT**

### **A. Rejection of Claims under 35 U.S.C. §112, 1<sup>st</sup> Paragraph**

In the Final Action, claims 11-15, 20-22, 24, 32-44, 60-75 and 97-108 were rejected on the basis of 35 U.S.C. §112, first paragraph, and raises the following issues:

- a) Whether the subject matter of the appealed claims (except, presumably, claims 107 and 108) is adequately described in the specification with respect to the phrase “in an animal having a tumor”;
- b) Whether the subject matter of claims 11-15, 20-22, 24, 32-44 and 108 is adequately described in the specification with respect to the phrase “wherein overexpression is defined as overexpression relative to *dl309*”;
- c) Whether the specification provides written description support for the language “is detectable by western blot, cell lysis, virus release or by cell spreading assay” found in claims 32 and 103-106; and
- d) Whether the specification describes the possibility of including more than one of the four alternatives (elements a) through d)) for upregulating the expression of the adenovirus death protein (“ADP”) set forth in claim 102, claim 60 and claims depending therefrom (claims 60-75 and 97-100, 102).

Appellants will address each of these rejections separately below.

***1. The subject matter of the appealed claims (except, presumably, claims 107 and 108) is adequately described in the specification with respect to the phrase “in an animal having a tumor.”***

***a) The Examiner’s Rejection***

In the Final Action, the Examiner rejected all of the claims (except, presumably, claims 107 and 108) under §112, first paragraph, taking the position that the specification fails to disclose the treatment of an “animal having a tumor.” The Action acknowledges that the specification does provide support for the treatment of humans having a tumor (claims 107 and 108), but argues that it does not provide written description support for the treatment of animals other than humans. The Action makes reference to the myriad of different types of “animals” that would be embraced by the rejected language.

**b) Remarks**

In response, Appellants contend that the specification would apprise the skilled artisan that it contemplates treatment of animals with tumors. Thus, the Action's concern with protozoans and sponges would appear to be unfounded. First of all, the specification is not limited to human tumors and, in fact, contemplates the treatment of "tumors of any origin":

The invention also provides compositions comprising a recombinant vector that overexpresses ADP in an amount effective for promoting death of neoplastic cells and a method comprising administering a therapeutically effective amount of the vector to a neoplastic cell in a patient. It is believed that the compositions and methods of the present invention *are useful for killing neoplastic cells of any origin* and include neoplastic cells comprising tumors as well as metastatic neoplastic cells.

Specification at page 17, lines 16-21 (emphasis supplied). Furthermore, the specification actually sets forth examples of the treatment of animals. This is shown in Examples 4 and 8 of the specification, which demonstrate the treatment of mice having tumors and specifically uses the word "animal" (see specification, page 27, lines 20-21).

The Action's position appears to rely on its interpretation of the meaning of the term "patients" and equates this term with "human patients." However, it is certainly true that an animal can be a "patient," as evidenced by the fact that we have veterinarians and "animal" hospitals.

The Board is therefore requested to overturn the Examiner on this point.

2. *The subject matter of claims 11-15, 20-22, 24, 32-44 and 108 is adequately described in the specification with respect to the phrase "wherein overexpression is defined as overexpression relative to dl309."*

The Action next takes the position the specification fails to provide written description support for the phrase "wherein overexpression is defined as overexpression relative to dl309,"

found in claims 11-15, 20-22, 24, 32-44 and 108. The Examiner's arguments can be summarized as follows, and the Appellants' response to each follow:

- a) ***That the dl309 adenovirus is not a wild type adenovirus and that there is no evidence that dl309 expresses ADP as high as any previously known adenovirus.***

In response, Appellants note that whether *dl309* is a wild type adenovirus or not, or whether it expresses ADP as high as any previously known adenovirus, is irrelevant to the written description issue. Nevertheless, it is specifically noted that on page 25, lines 28-30, the specification characterizes Ad5, *dl309* and *dl01/07* as "viruses expressing wild-type amounts of ADP." The Examiner has presented no evidence to call into question the objective truth of this statement. *In re Marzocchi*, 439 F.2d 220, 223-24, 169 USPQ 367, 370 (CCPA 1971).

The issue is whether one of skill in the art would understand from the specification that the inventors contemplated that *dl309* was intended to be a standard against which one can measure overexpression. From a review of the specification, there can be no doubt that *dl309* was intended to be just such a standard. This is evident from a reading of the specification at page 12, lines 18-23 and Example 1. At page 12, lines 18-23, the specification defines "overexpression of ADP" *per se* (as opposed to overexpression relative to *dl309*) to mean that more ADP molecules are made in the infected cell relative to previously known adenoviruses. Example 1 of the specification tests the four exemplary embodiments of the invention, KD1, KD3, GZ1 and GZ3, by comparing their ability to express ADP relative to exemplary previously known adenoviruses, including *dl01/07*, *dl309*, *dl327* and Ad5 (wild type adenovirus). Specification at pages 21-25.

KD1 and KD3 are adenoviral vectors that have the so-called 01/07 mutations in their E1 region that render them replication competent primarily only in neoplastic cells and which



further contain deletions in their E3 region that up-regulate ADP expression. GZ1 and GZ3 have the ADP up-regulating E3 mutations, but do not contain the E1 region mutations and thus their replication is not restricted. Contrary to the Examiner's position in various previous official actions, **ALL** of these vectors, KD1, KD3, GZ1 and GZ3, are representative of the vectors embraced by the claims in that all are replication-competent in neoplastic cells and all have E3 mutations that upregulate ADP expression.

On page 24 of the specification it is also explained that *dl01/07* is the parent vector of KD1 and KD3, except without the ADP-upregulating E3 mutations. Thus, *dl01/07* is replication-restricted to neoplastic cells but do not overexpress ADP. It is also explained that *dl309* is the parent of all of the exemplary vectors of the invention, except that it contains neither the E1 "replication-restriction" mutations nor the ADP up-regulating E3 mutations. Another control vector, *dl327*, is a negative control in that it lacks the ADP gene altogether.

The studies reported on page 24 show that each of the exemplary vectors of the invention overexpress ADP relative to each of the forgoing vectors.

The Examiner's main contention is that the specification allegedly does not state the specific words that *dl309* is intended to be a control against which the ADP expression of ALL vectors of the invention are to be measured. However, it is submitted that a fair reading of the specification, from the standpoint of one of skill, is that the vectors were employed in the examples – not just example 1, but in generally each of the examples – for the very purpose of demonstrating what was intended by "ADP overexpression." Why else were these vectors chosen and presented as ADP expression controls and included as such in virtually all of the examples?

- b) That the expression of ADP by dl309 or the KD or GZ vectors was not measured in terms of molecules of ADP per viral genome as per page 12, lines 18-21.***

The issue of whether the specification discloses a calculation of the number of molecules of ADP per viral genome is irrelevant to the issue of written description for the rejected phrase, which does not call for such a measurement. The phrase simply refers to overexpression of ADP and the specification describes a number of ways for determining such overexpression, as evidenced by Example 1.

- 3. The specification does provide written description support for the language “is detectable by western blot, cell lysis, virus release or by cell spreading assay” found in claims 32 and 103-106.***

The Examiner’s main argument, it appears, is that these particular assays for ADP expression levels is only found in the examples for measuring ADP expression with respect to the four exemplary vectors, KD1, KD3, GZ1 and GZ3, and that thus these assays are allegedly not described as a general technique for measuring ADP expression from other vectors within the scope of the claims. With respect to cell lysis assay, the specification analyzes the results of that assay by observing that the assay shows that “over-expression of ADP increases the rate of cell lysis.” Page 25, lines 18-21. Similarly, with respect to the virus release assay, the specification shows that the assay is capable of distinguishing between viruses “which overexpress ADP” and those “expressing wild-type amounts of ADP.” Page 25, lines 28-30. Likewise, with respect to the cell spreading assay, the specification uses the assay to measure the ability of viruses to lyse cells and spread to newly infected cells and demonstrates “the potency of ADP in mediating ... virus spread in A549 cells.” Page 26, lines 5-6.

With respect to the cell lysis and cell spreading assays, the Examiner states that the example “does not suggest that either assay is to be used to determine whether ADP is

overexpressed by a given adenovirus vector used in the invention.” Action at page 5. This is not true. The specification, at page 25, lines 20-21, specifically states that “ADP is required for efficient cell lysis, and over-expression of ADP increases the rate of cell lysis.” This statement is a generalized observation that is, on its face, clearly not limited to the exemplary vectors that were tested. Furthermore, as explained in the first full paragraph of page 26 (lines 4-13), the cell spreading assay is simply one way of assessing cell lysis (“This result [the cell spreading assay] attests to the potency of ADP in mediating cell lysis and virus spread in A549 cells [the target cells used in the assay].”)

The Examiner’s reliance on the *Purdue Pharma* case is misplaced. In *Purdue Pharma*, the limitation at issue was the so-called  $C_{\max}/C_{24}$  ratio which was used in the claims in an attempt to define the class of agents that the claim covered. In the specification at issue there, the  $C_{\max}/C_{24}$  ratio was not discussed at all, but merely employed *ex post facto* to characterize two formulations. Nowhere in the patent specification at issue in *Purdue* was it stated that the  $C_{\max}/C_{24}$  ratio was intended to be a distinguishing characteristic, with the court characterizing the  $C_{\max}/C_{24}$  ratio as “...a characteristic that is not discussed even in passing in the disclosure ...”). 56 U.S.P.Q.2d at 1487.

In contrast, the issue here is the “overexpressing” language and how to interpret that language. There is no question that the specification identifies “overexpression” of ADP as a central focus of the invention, and it is identified throughout the specification as a desirable quality in virtually all embodiments. The question is merely how the specification teaches to measure overexpression, and there are four examples of how to measure overexpression given in Example 1. The Example in no way implies that these four methods are only applicable to KD1, KD2, GZ1 and GZ3 – on the contrary, the specification nowhere says that ADP overexpression

is only desirable for these four vectors, and the examples merely provide an example as to how one might proceed to measure ADP expression.

4. *The specification describes the possibility of including more than one of the four alternatives (elements a) through d)) for upregulating the expression of the adenovirus death protein (“ADP”) set forth in claims 60 and claims depending therefrom (claims 60-75 and 97-100, 102).*

The Action next rejects claim 60, alleging that the specification does not provide support for including “more” than one of the indicated adenovirus modifications at a time. Appellants traverse this rejection as well. The Board’s attention is directed to the specification at page 13, lines 2-8, particularly at line 5. Appellants agree with the Action that this excerpt presents these four characteristics as alternatives. However, it also presents these characteristics as cumulative and combinable, particularly in light of the fact that the specification specifically employs the inclusive connector “and” when listing the possible elements. See specification at page 13, line 5.

#### 5. *Conclusion*

For the reasons outlined above, the Board is requested to overturn the Examiner’s positions regarding written description.

#### **B. Rejection of Claims Under 35 U.S.C. §112, 2<sup>nd</sup> Paragraph**

The Final Action next rejects claims 101-102 under 35 U.S.C. §112, 2<sup>nd</sup> paragraph, taking the position that the phrase “overexpresses an adenoviral death protein,” renders the claims unclear as to the metes and bounds of the claim. The Action queries regarding “overexpresses relative to what?” and also states that a “reasonably broad interpretation of these claims would suggest any adenovirus carrying ADP operatively linked to its native promoters” would meet the limitation of the claims.

In response to the Action's query regarding "overexpression relative to what," Appellants point out that there is a specific definition, at page 12, lines 18-23, for what overexpression is measured against in the context of claims such as claims 101-102 that do not specify the reference virus. Here it is stated that "'overexpresses ADP' means that more ADP molecules are made per viral genome present in a dividing cell infected by the vector than expressed by any previously known recombinant adenoviral vector or AAV in a dividing cell of the same type." As already discussed above, the specification discloses various assays for determining whether more ADP molecules are made per viral genome.

In light of the very clear definition set forth in the specification, the Action's position that a "reasonably broad interpretation of these claims would suggest any adenovirus carrying ADP operatively linked to its native promoters" would meet the limitation of the claims, is not understood. Such an adenovirus would only meet the limitation of the claims if it was shown to express more ADP molecules per viral genome present in a dividing cell infected by the vector than expressed by any previously known recombinant adenoviral vector in a dividing cell of the same type.

For the foregoing reasons, the Board is requested to overturn the Action's rejections in this regard.

**C. Rejection of claims 10-13, 32-44, 60, 61, 68, 69, 72-75, 97-99 and 101-108 is anticipated by Henderson *et al.* ("Henderson"; Exhibit 1) or Little *et al.* ("Little"; Exhibit 2) under 35 U.S.C. §102(e)**

The Final Action next rejects claims 10-13, 32-44, 60, 61, 68, 69, 72-75, 97-99 and 101-108 as anticipated by Henderson *et al.* ("Henderson"; Exhibit 1) or Little *et al.* ("Little"; Exhibit 2) under 35 U.S.C. §102(e). The Action takes the position that Henderson and Little both teach an adenovirus, CN751, that has E3 deletions yet retains the ADP gene and thus would be expected to overexpress ADP.

Appellants note that claim 10 is included in this rejection. However, claim 10 was canceled as per the Amendment dated December 3, 2003. Appellants will therefore assume that the inclusion of claim 10 in this rejection was erroneous.

In responding to the rejection, Appellants will provide separate arguments with respect to various claims and will group the claims accordingly.

**1. The “Overexpresses ADP” Claims 11- 13, 32-44, 101-106, and 108**

Appellants will first address the anticipation rejection with respect to the “overexpressing ADP” claims that have been rejected, which, of those now active, includes claims 11-13, 32-44 and 101-106, and 108.

**a) It is the Examiner’s Burden to Show Anticipation**

The Final Action takes the position that it is the Appellants’ burden to demonstrate that the CN751 vector of Henderson and Little does not overexpress ADP. Appellants disagree. Since this is an anticipation rejection, the Examiner must demonstrate that each and every element of the claims is either explicitly or necessarily disclosed in the allegedly anticipatory art. That has not been done here. Each of the “overexpresses ADP” claims require *overexpression* of ADP and there is no teaching anywhere in either Henderson or Little that the vectors they describe overexpress ADP, as that term is used.

The Examiner likens the present situation to the examination of product-by-process claims, where the burden is sometimes shifted to applicants due to the fact that the PTO does not have the necessary laboratories to carry out processes and compare the product so produced against the prior art. However, the situation here is different. The claims specify a particular feature that must be possessed to be within the scope of the claim, and the Examiner has presented no evidence to suggest that that the prior art has such a property. To shift the burden to the applicant, the examiner must provide evidence to demonstrate that the prior art

“necessarily” has the claimed property. *In re Robertson*, 169 F.3d 743, 745 (Fed. Cir. 1999). As noted by the Federal Circuit, “[i]nherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.” *Id.* at 1269, 20 U.S.P.Q.2d at 1749 (quoting *In re Oelrich*, 666 F.2d 578, 581, 212 U.S.P.Q. 323, 326 (C.C.P.A. 1981)). The Examiner here has not satisfied this burden.

***b) CN751 Does Not Overexpress ADP***

Furthermore, even if the Examiner has shifted the burden to Appellants to demonstrate that the prior art does not have the claimed property, it is noted that Appellants have done so. Both Henderson and Little teach that CN751 expresses about the same amount of ADP as does wild-type adenovirus, and thus cannot be said to overexpress ADP. This can be seen in Henderson, for example, at col. 49, lines 6-8. Here it is stated that CN751 kills cells more efficiently than an ADP-minus control, but about the same as an ADP-positive wild-type control, Rec700. See also Little *et al.* patent at col. 40, lines 24-26. We know from the present specification that cell killing is a good measure of ADP expression. See Example 2. We also know that dl309, the standard against which claim 13 and claims depending therefrom are measured, expresses “wild-type” levels of ADP. Specification at page 25, lines 28-30. Since we know from Henderson and Little that CN751 expresses wild-type levels of ADP, and in light of the fact that the claims require higher ADP expression than dl309 which expresses wild-type levels, it can be concluded that CN751 does not anticipate these claims.

One of the Action’s responses to this argument is that Appellants have allegedly “indicated on the record (response filed 1/10/02, page 7) that CN751 would be expected to overexpress ADP.” Applicant denies that such a representation was made – the statement referred to by the Examiner was a recitation of the pending rejection that failed to fully attribute the statement to the Examiner. In other words, it was a poorly drafted statement that was never

intended to make any admission about what the prior art teaches or does not teach, it simply failed to attribute the statement to the Examiner, which was what was intended. In any event, the question is whether Little or Henderson teaches a vector that overexpresses ADP, and the reality is, as explained above, neither reference teaches overexpression of ADP.

The Action also argues that Henderson/Little teach placing ADP under control of a heterologous promoter (tissue specific or viral promoter), or inclusion of multiple copies of ADP, and that the use of such a heterologous promoter “would be expected to result in overexpression compared to *dl309*.” In response to the Examiner being requested to set forth the basis for the conclusion that either of these embodiments would result in overexpression, the Action now states that the instant specification teaches, at page 13, that placing ADP under the control of a heterologous promoter is one means of achieving ADP overexpression. However, this position is insufficient: There are all kinds of heterologous promoters, and Henderson/Little are silent as to what kind of heterologous promoter should be used and is silent as to whether the ultimate objective is to achieve overexpression, or even that overexpression of ADP is a desirable goal. In contrast, Appellants’ specification gives an example of a useful heterologous promoter in this regard, the cytomegalovirus promoter.

Furthermore, there is no disclose in Henderson or Little pertaining to detection of adenovirus ADP by western blot or cell spreading assay.

For the foregoing reasons, it is evident that the Action fails to make out a *prima facie* anticipation of the ADP overexpression claims. (For the sake of completeness, Applicants also incorporate by reference here the comments set forth below with respect to the remaining claims alleged to be anticipated).



**c)     *The Present Inventors Conceived of Vectors that Overexpress ADP, and their Use in Cancer Therapy, Before the Henderson/Little Priority Date, and Were Diligent in Reducing to Practice***

To demonstrate prior conception and diligence to reduction to practice, Appellants have attached and will rely on two separate declarations of the inventors now on file, including the declaration filed with the response dated 1/6/03 (“Wold I”; Exhibit 4) together with the separately bound exhibits A-L to the Wold I declaration, and the supplemental declaration filed with the response dated September 3, 2003 (“Wold II”; Exhibit 5). It is noted that the Wold II declaration incorporates Wold I in its entirety. See para. 1 of Wold II. The two art references relied upon by the Examiner, Little and Henderson, have a priority date of no earlier than March 3, 1997.

**(1)     The Research Proposal, Exhibit B to Wold I**

We would first direct the Board’s attention to Exhibit B of Wold I. This document is a research proposal dated well prior to 3/3/97, and describes the present inventors’ goal of preparing adenovirus vectors that overexpress the ADP gene (referred to here as the E3-11.6K gene). In section B of the proposal, the inventors describe the preparation of adenovirus mutants that express the ADP gene, and describe the function of the ADP gene to promote cell death. The inventors note that these earlier studies, using ADP+ and ADP- adenovectors, demonstrated that the ADP gene indeed functioned to promote cell death in infected cells. Based on these earlier studies, the inventors concluded that “[s]ince the 11.6K protein can promote the cell death of adenovirus-infected, it has the potential use as a therapeutic agent to kill cells, *e.g.*, malignant cell, in humans.” Section B, page 3. Questions are then posed as to how the ADP gene might be applied in human therapy – questions that are addressed in remaining portions of the exhibit.

Turning to page 6 of the Exhibit B research proposal, it is stated that one way to potentially achieve this goal is to construct a vector deleted in the E1A, E1B and E3 regions, wherein the ADP gene is reinserted in an expression cassette driven by the CMV promoter. Page 6, second full paragraph. Then, in section C.3., beginning on page 7, it is alternatively proposed to test the ability of an ADP expressing vector to overexpress the ADP gene (*i.e.*, the 11.6K gene) during early stages of infection by constructing a vector into which the “11.6K gene will be built in” yet which lacks all other E3 region genes and which contains all other adenovirus genes. Such vectors are, in essence, the principal exemplary embodiments of the present invention.

Beginning on page 8, section D., the proposal goes on to suggest the preparation of vectors that “optimize expression” [viz, “overexpress”] of the ADP gene, and mention the possibility of preparing “nondefective” vectors (that is, replication competent vectors).

On pages 9-10 of the proposal, the inventors indicate that they will test the various constructs in animal models to assess their potential efficacy in treating cancer.

## **(2) Construction and Testing of KD1 Prior to 3/3/97**

The Wold I declaration provides additional evidence of conception prior to 3/3/97. In paragraph 5 of Wold I, the inventors detail the following studies conducted prior to 3/3/97:

- the observation that a mutation in the ADP resulted in the slower development of infection as compared to vectors having wild-type ADP;
- the observation that when target cancer vectors prepared with portions of the E3 region removed + reinsertion of the ADP gene resulted in larger plaques, and developed plaques faster, than wild-type (see third bullet point of paragraph 5); and

- gel electrophoresis and immunofluorescence studies demonstrating that E3-deleted, ADP expressing vectors produced higher levels of ADP than wild-type (fourth bullet point of paragraph 5).

Then, in paragraph 6 of Wold I, the inventors provide details on the construction of an ADP overexpressing vector prior to 3/3/97. This is the KD1 vector described in the specification (see, *e.g.*, page 22, Table 1) and which comprises the removal of E3 genes and reinsertion of the ADP gene. In particular, paragraph 6 and the supporting documentation demonstrates that KD1 was actually constructed prior to 3/3/97 and the structure of the E3 region and ADP gene of KD1 was as expected (see, *e.g.*, page 4).

Thus, prior to the filing date of Henderson/Little, the present inventors had conceived of the idea of preparing vectors with E3 deletions + reinsertion of the ADP gene for the purpose of testing overexpression of ADP and for the purpose of developing a cancer therapeutic. Further, they demonstrated that such constructs overexpressed ADP as compared to wild-type and actually prepared the KD1 vector prior to that time. All that remained was testing of the KD1 vector to confirm that it did overexpress ADP (although this had already been shown by them with another such vector) and to show its ability to kill cancer cells in animals. Both of these objectives were diligently attained by the inventors in very short order.

### **(3) Confirmation that KD1 Overexpressed ADP**

Turning now to paragraph 7 of Wold I, the inventors detail studies on KD1 that were conducted in March, April and May of 1997, and present relevant studies that were carried out on KD1 and the KD vectors on virtually every day during those months. In particular, it is shown that at least as early as 5/9/03 to 5/23/03, the inventors conducted plaque assays on KD1 which demonstrated that KD-1 overexpressed ADP. See entries on page 8 of Wold I under the headings “5/9/97 – 5/23/97” and “5/13/97 – 6/2/97”.

#### **(4) Successful Animal Testing**

The Wold II declaration demonstrates the successful testing of KD1 in an animal having cancer. The inventors there show that on July 7, 1997, they sent KD1, dl1101/1107, dl309, and A549 cells to Dr. Jeffrey A. Whitsett at the Children's Hospital Medical Center, Division of Pulmonary Biology, Cincinnati, OH. A copy of the cover letter sent to Dr. Whitsett is attached to Wold II as Exhibit M. They state that Dr. Whitsett had agreed to test these vectors on their behalf in the A549 nude mouse model, in which A549 human lung carcinoma cells are used to establish tumors in nude mice following by injection of the various vectors to determine their anticancer efficacy. On September 16, 1997, the inventors received a report from Dr. Whitsett's colleague, Lee Zhang, indicating that "10<sup>9</sup> pfu of each of the viruses were injected into each established A549 tumor. 4 out of 6 tumors injected with KD1 showed slowed tumor growth while 2 out of 2 tumors injected with dl309 and 4 out of 4 injected with dl 1101/1107 continued to grow." A copy of this fax is attached to Wold II as Exhibit N.

From the foregoing it is respectfully submitted that conception plus diligence to a reduction to practice has been shown.

In the Final Action, the Examiner raises various points in rebuttal, which Appellants would like to address:

First, in the paragraph bridging pages 10-11, the Action states that Exhibit B to Wold I is merely a research proposal, that it teaches away from using vectors that are "replication competent" in neoplastic cells and that there was no nexus between the Exhibit B proposal and KD1. In response, it is submitted that whether or not the exhibit is a research proposal is irrelevant where, as here, it denotes the inventor's goal and provides a road map to how they planned to achieve that goal. Further, the proposal does suggest the construction of "nondefective" replication competent vectors at D.1. on page 8. Lastly, while the proposal does

not mention KD1 by name, it certainly contemplates the principal attribute of KD1 at issue here – that it comprises an E3-deletion with reinsertion of the ADP gene for “optimization” (*i.e.*, overexpression) of ADP during early stages of infection (as contrasted with late stages).

The Action further states that it was not known prior to 3/3/97 whether KD1 overexpressed ADP. This argument by the Examiner is not particularly relevant in that it overlooks the fact that the declaration DOES demonstrate that the inventors had prepared OTHER vectors with a deleted E3 region and inserted ADP gene, very similar to KD1, and demonstrated that these vectors overexpressed ADP. See bullets 3 and 4 of paragraph 5 of Wold I. Thus, it is clear from the evidence that the inventors had constructed other similar vectors prior to 3/3/97 that were shown to overexpress ADP, and it is evident that it was their intention in preparing KD1 that it have this property as well. It was indeed confirmed to have this desirable property within two months of 3/3/97 after diligent work toward this goal.

The Final Action, at page 11, also takes the position that the declarations do not demonstrate conception of the claimed invention as a whole. This argument is disagreed with on at least two bases: one, an antedating declaration under Rule 131 need only show so much as the prior art shows, which has been done, and, two, there is no requirement that a Rule 131 declaration demonstrate a reduction to practice of an entire genus.

First, the law is clear that a Rule 131 declaration need only show so much as the prior art discloses. See, *e.g.*, *In re Stempel*, 113 U.S.P.Q. 77 (CCPA 1957). Thus, it is submitted that the present Applicants carried out in the United States studies that demonstrate the reduction to practice of an ADP-overexpressing adenovirus and successful demonstration of tumor growth suppression prior to the March, 1998, effective filing date of the CN751 description in Little/Henderson. Under the doctrine of *In re Stempel*, it is submitted that the Little/Henderson

references have been antedated inasmuch as the Rule 131 showing is at least commensurate in scope with that found in the March 1997 and March 1998 respective filing dates of the Henderson/Little patents.

Furthermore, the law is also clear that Rule 131 declarations are not required to set forth a reduction to practice across the claimed genus. For example, in *In re Hostettler*, 148 U.S.P.Q. 514 (CCPA 1966), the court was adamant in reversing the PTO on this very point:

Rule 131 requires applicant to make oath to facts showing a completion “of the invention.” That requirement does not mean affiant must show a reduction to practice of every embodiment of the invention. Nor is that requirement coextensive with the amount of disclosure necessary to support a claim under 35 USC 112.

148 U.S.P.Q. at 516.

Furthermore, the fact that Appellants’ reduction to practice was demonstrated with a vector having some differences from CN751 in no way undermines Appellants’ claim to priority. The fact is, if there are differences, the differences are not relevant to the fundamental issue of who first demonstrated reduction to practice of the central concept of expressing or overexpressing ADP from a recombinant adenovirus for the purposes of cancer therapy. That showing has clearly been made by the present Applicants. Furthermore, the case law again strongly supports our position. For example, *In re Clarke*, 148 U.S.P.Q. 665 (CCPA 1966), presented the situation where the Rule 131 affidavit described embodiments that were similar to but distinct from the disclosure contained in the reference at issue. In reversing the Board and the examiner, the court observed that:

We believe that Stempel ... is not limited to the fact situations where the inventor can show priority as to the identical compound described in the reference. It seems that in an appropriate case as applicant should not be prevented from obtaining a patent to an invention where a compound described in a reference would have been obvious to one of ordinary skill in that art in view of

what the affiant proves was completed with respect to the invention prior to the effective date of the reference.

148 U.S.P.Q. at 670. Here, the fact that Applicants' earlier-reduced-to-practice KD1 included the 01/07 E1 mutation in addition to the upregulating ADP/E3 mutations should thus in no way detract from the ability of KD1 to effectively antedate a reference teaching the ADP/E3 mutations without the 01/07 mutations. Stated another way, KD1 would appear to anticipate or at least obviate CN751, at least to the extent that both are principally concerned with vectors that express ADP as the operative lytic agent.

Therefore, in view of the above, the "overexpress ADP" claims are not anticipated by Henderson or Little.

**2.     *The Structural Claims – Claims 60, 61, 68, 69, 72-75, 97-99, 107***

The Action rejects structural claims 60, 61, 68, 69, 72-75, 97-99, and 107 as anticipated by Henderson and Little, noting merely that these claims do not require overexpression of ADP.

Henderson and Little are not available as prior art because Appellants have demonstrated prior conception and diligence to reduction to practice in advance of the priority dates of Henderson and Little. The foregoing evidence of conception and reduction to practice, incorporated herein by reference, fully applies to claim 60 and claims depending therefrom.

As noted above, Appellants have attached and relied on two separate declarations of the inventors now on file, including the declaration filed with the response dated January 6, 2003 ("Wold I"; Exhibit 4) together with the separately bound exhibits A-L to the Wold I declaration, and the supplemental declaration filed with the response dated September 3, 2003 ("Wold II"; Exhibit 5). As noted above, the Wold II declaration incorporates Wold I in its entirety. See para. 1 of Wold II. The two art references relied upon by the Examiner, Little and Henderson, have a priority date of no earlier than March 3, 1997.

As discussed above, prior to the filing date of Henderson and Little, the present inventors had conceived of the idea of preparing vectors with E3 deletions plus reinsertion of the ADP gene for the purpose of testing overexpression of ADP and for the purpose of developing a cancer therapeutic. Further, they demonstrated that such constructs overexpressed ADP as compared to wild-type and actually prepared the KD1 vector prior to that time. All that remained was testing of the KD1 vector to confirm that it did overexpress ADP (although this had already been shown by them with another such vector) and to show its ability to kill cancer cells in animals. Both of these objectives were diligently attained by the inventors in very short order.

As noted above, the structural claims do not require overexpression of ADP. Rather than requiring “overexpression” of ADP, these claims require an adenovirus vector having certain structural features. For example, according to independent claim 60, the adenovirus vector must be replication-competent in neoplastic cells, and must express an ADP, wherein: (1) the ADP is expressed from an ADP coding sequence positioned under the control of a promoter other than the endogenous promoters for ADP; (2) the adenovirus vector comprises a deletion in the E3 region that removes a splice site for an E3 mRNA; (3) the ADP is expressed from an ADP coding sequence flanked by a pre-mRNA splicing and cleavage/polyadenylation signal other than the pre-mRNA splicing and cleavage/polyadenylation signal normally associated with the ADP gene; and/or (4) the ADP is expressed from an ADP coding sequence that is positioned downstream of the coding sequence for another adenovirus mRNA, together with a sequence on the 5’ side of the ADP coding sequence that allows for internal initiation of translation of ADP. Thus, there is *no* requirement that the adenovirus vectors required for these claims must overexpress ADP.



Although the present inventors have provided evidence that their vectors overexpressed ADP, they were not required to do so since the structural claims do not require a vector that overexpresses ADP. Furthermore, the fact that the structural claims do not require overexpression renders irrelevant the Examiner's argument that KD1 was not shown to overexpress ADP prior to Mar. 3, 1997.

In view of the above, Henderson and Little are not available as prior art. Accordingly, the Board is requested to overturn the Examiner's position regarding anticipation.

**D. Rejection of claims 13, 20-22, 60, and 64-66 under 35 U.S.C. §103(a) over Henderson *et al.* ("Henderson"; Exhibit 1) or Little *et al.* ("Little"; Exhibit 2) as applied to claims 10-13, 32-44, 60, 61, 68, 69, 72-75, 97-99, and 101-108, and further in view of Freytag (Exhibit 3)**

The Action next rejects claims 13, 20-22, 60 and 64-66 as obvious over Henderson and Little in light of Freytag. Henderson and Little are discussed above. Freytag is alleged to teach combination therapy using adenoviruses and chemotherapy and/or radiation. Appellants respectfully traverse.

***1. Henderson and Little are not Available as Prior Art, and Freytag Alone Fails to Teach or Suggest the Claimed Invention***

For the reasons discussed above, which are specifically incorporated into this section, Henderson and Little are not available as prior art. As set forth above, Henderson and Little are not available as prior art because Appellants have demonstrated prior conception and diligence to reduction to practice in advance of the priority dates of Henderson and Little. This is true for both the "overexpress ADP" claims at issue in this rejection (*i.e.*, claims 13, and 20-22) and the structural claims at issue in this rejection (*i.e.*, claims 60 and 64-66).

In order to establish a *prima facie* case of obviousness, three basic criteria must be met: (1) the prior art reference (or references when combined) must teach or suggest all the claim

limitations; (2) there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings; (3) there must be a reasonable expectation of success. *Manual of Patent Examining Procedure* § 2142. See also *In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q. 2d 1438 (Fed Cir. 1991) (emphasizing that the teaching or suggestion to make the claimed combination and the reasonable expectation of success must be both found in the prior art, and not based on applicant's disclosure). It is important to note that all three elements must be shown to establish a *prima facie* case of obviousness. Thus, if one element is missing, a *prima facie* case of obviousness does not exist.

Freytag alone fail to teach or suggest the claimed invention. Indeed, Freytag has no bearing on the claimed invention. Freytag pertains to a replication competent, E1B-attenuated so-called suicide gene adenovirus vector comprising the cytosine deaminase (CD)/herpes simplex virus type-1 thymidine kinase gene. There is no mention of an ADP gene, vectors employing the ADP gene, or upregulated ADP in Freytag. This suicide gene construct is specially constructed to be used with radiation and chemotherapy. There is no motivation to employ radiation except in connection with vectors that bear the special suicide CD/HSV-1 TK gene construct. Accordingly, there is no basis in this reference to arrive at the invention of claims 13, 20-22, 60 or 64-66. Thus, no *prima facie* rejection has been established.

**2. *Even if Henderson and Little were Available as Prior Art, there is no Prima Facie Case of Obviousness***

As set forth above, Appellants have demonstrated that Henderson and Little are not available as prior art. Even if these references were available as prior art (and Appellants herein make no such admission), there would still be no *prima facie* case of obviousness.

With respect to independent claims 13 and 60, Freytag adds nothing to the teachings of Henderson and Little that is relevant to the subject matter of these claims. As to claim 13, Freytag fails to teach or suggest an adenovirus vector that overexpresses ADP. As to claim 60, Freytag fails to teach or suggest the structural limitations set forth in claim 60.

With respect to the dependent claims, Freytag merely discloses a so-called suicide gene adenovirus vector comprising the CD/HSV-1 TK gene. This suicide gene construct is specially constructed to be used with radiation and chemotherapy. As noted above, there is no mention of an ADP gene or vectors employing the ADP gene or upregulated expression of ADP, and thus no motivation to employ radiation except in connection with vectors that bear this special suicide CD/HSV-1 TK gene construct. In addition, there is no motivation to employ chemotherapy except in connection with vectors that bear the special suicide CD/HSV-1 TK gene construct. Accordingly, there is no basis for combining this reference with the ADP teachings of Henderson and Little to arrive at the invention of claims 13, 20-22, 60, or 64-66. Thus, no *prima facie* case of obviousness has been established.

Accordingly, for each of the foregoing reasons, the Board is requested to overturn the Examiner's position regarding obviousness of the claimed invention.

**E. Double Patenting of Claims 10-13, 32-44, 60, 61, 72-75, and 97-108**

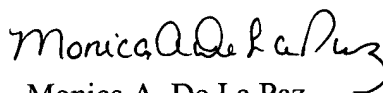
Claims 10-13, 32-44, 60, 61, 72-75 and 97-108 are rejected under the judicially-created doctrine of obviousness-type double patenting as being unpatentable over claims 1-11 of U.S. Patent 6,627,190. Without conceding that the claims at issue are not patentably distinct from the claims of the '190 patent, Applicants will remove the issue of double patenting for these claims by filing a terminal disclaimer. The terminal disclaimer has been filed concurrently with submission of this appeal brief, and a copy is attached as Appendix 3.

## IX. CONCLUSION

Appellants have provided arguments that overcome the pending rejections. Appellants respectfully submit that the Office Action's conclusions that the claims should be rejected are unwarranted. It is therefore requested that the Board overturn the Action's rejections.

Please date stamp and return the enclosed postcard to evidence receipt of this document.

Respectfully submitted,



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Date: November 3, 2004

## APPENDIX 1

### PENDING CLAIMS

11. The method of claim 13 wherein the adenovirus death protein comprises SEQ ID NO:5, SEQ ID NO:6, SEQ ID NO:7, or SEQ ID NO:8, SEQ ID NO:9, SEQ ID NO:10, SEQ ID NO:11 or SEQ ID NO:12.

12. The method of claim 13, wherein the adenovirus vector comprises a recombinant adenovirus lacking expression of at least one E3 protein selected from the group consisting of: gp19K; RID $\alpha$ ; RID $\beta$  and 14.7K.

13. A method for treating cancer in an animal having a tumor comprising administering to the tumor an adenovirus vector wherein said adenovirus vector is replication-competent in neoplastic cells and overexpresses an adenovirus death protein (ADP), wherein overexpression is defined as overexpression relative to *d1309*.

14. The method of claim 13, further comprising the step of passively immunizing the animal against the adenovirus vector.

15. The method of claim 14, wherein the adenovirus vector comprises SEQ ID NO:1 or SEQ ID NO:2.

20. The method of claim 13, further comprising treating the tumor with radiation.

21. The method of claim 20 comprising administering more than one distinct type of recombinant adenovirus to the tumor and treating the tumor with radiation, wherein at least one recombinant adenovirus is replication-defective.

22. The method of claim 13, further comprising treating the tumor with chemotherapy.

24. The method of claim 13, further comprising administering to the tumor one or more replication-defective adenoviruses, wherein each replication-defective adenovirus expresses an anti-cancer gene product, and wherein the adenovirus vector facilitates the spread of the replication-defective adenovirus in the tumor.

32. The method of claim 13, wherein overexpression relative to *dl309* is detectable by western blot, cell lysis, virus release or by a cell spreading assay.

33. The method of claim 13, wherein the adenovirus vector lacks expression of at least one E3 protein selected from the group consisting of gp19K, RID $\alpha$ , RID $\beta$  and 14.7K.

34. The method of claim 33, wherein the adenovirus vector lacks expression of the gp19K protein.

35. The method of claim 33, wherein the adenovirus vector lacks expression of the RID $\alpha$  protein.

36. The method of claim claim 33, wherein the adenovirus vector lacks expression of the RID $\beta$  protein.

37. The method of claim 33, wherein the adenovirus vector lacks expression of the 14.7K protein.

38. The method of claim 33, wherein the adenovirus vector lacks expression of the gp19K, RID $\alpha$ , RID $\beta$  and 14.7K proteins.

39. The method of claim 28, wherein the adenovirus vector comprises a deletion in the E3 region that removes a splice site for any of the E3 mRNAs.

40. The method of claim 13, wherein the adenovirus vector comprises at least one deletion in the E3 region, wherein the at least one deletion comprises a sequence that encodes at

least one E3 protein, wherein the protein is selected from the group consisting of gp19K, RID $\alpha$ , RID $\beta$ , and 14.7K.

41. The method of claim 40, wherein the at least one deletion comprises a sequence that encodes the gp19K, RID $\alpha$ , RID $\beta$  and 14.7K proteins.

42. The method of claim 41, wherein the at least one deletion further comprises a sequence that encodes the 6.7K protein.

43. The method of claim 41, wherein the at least one deletion further comprises a sequence that encodes the 12.5K protein.

44. The method of claim 41, wherein the at least one deletion further comprises a sequence that encodes the 6.7K and 12.5K proteins.

60. A method for treating cancer in an animal having a tumor, the method comprising administering to the tumor an adenovirus vector that is replication-competent in neoplastic cells and expresses an adenovirus death protein (ADP), wherein:

- a) the ADP is expressed from an ADP coding sequence positioned under the control of a promoter other than the endogenous promoters for ADP;
- b) the adenovirus vector comprises a deletion in the E3 region that removes a splice site for an E3 mRNA;
- c) the ADP is expressed from an ADP coding sequence flanked by a pre-mRNA splicing and cleavage/polyadenylation signal other than the pre-mRNA splicing and cleavage/polyadenylation signal normally associated with the ADP gene, and/or
- d) the ADP is expressed from an ADP coding sequence that is positioned downstream of the coding sequence for another adenovirus mRNA, together with a sequence on the 5' side of the ADP coding sequence that allows for internal initiation of translation of ADP.

61. The method of claim 60 wherein the ADP comprises the sequence of SEQ ID NO:5, SEQ ID NO:6, SEQ ID NO:7, SEQ ID NO:8, SEQ ID NO:9, SEQ ID NO:10, SEQ ID NO:11 or SEQ ID NO:12.

62. The method of claim 60, further comprising the step of passively immunizing the animal against the adenovirus vector.

63. The method of claim 62, wherein the adenovirus vector comprises SEQ ID NO:1 or SEQ ID NO:2.

64. The method of claim 60, further comprising treating the tumor with radiation.

65. The method of claim 64 comprising administering more than one distinct type of recombinant adenovirus to the tumor and treating the tumor with radiation, wherein at least one recombinant adenovirus is replication-defective.

66. The method of claim 60, further comprising treating the tumor with chemotherapy.

67. The method of claim 60, further comprising administering to the tumor one or more replication-defective adenoviruses, wherein each replication-defective adenovirus expresses an anti-cancer gene product, and wherein the adenovirus vector facilitates the spread of adenoviruses in the tumor.

68. The method of claim 60, wherein the ADP is expressed from an ADP coding sequence positioned under the control of promoter other than the endogenous promoters for ADP.

69. The method of claim 68, wherein the ADP coding sequence is positioned under the control of a promoter that is exogenous to adenovirus.



70. The method of claim 60, wherein the ADP coding sequence is positioned behind a coding sequence for another adenovirus mRNA together with a sequence on the 5' side of the ADP coding sequence that allows for internal initiation of translation of ADP.

71. The method of claim 70, wherein the sequence on the 5' side of the ADP coding sequence that allows for internal initiation of translation of ADP is an Ad tripartite leader or a viral internal ribosome initiation sequence.

72. The method of claim 60, wherein the adenovirus vector comprises a deletion in the E3 region that removes a splice site for an E3 mRNA.

73. The method of claim 72, wherein the adenovirus vector lacks expression of at least one E3 protein selected from the group consisting of gp19K, RID $\alpha$ , RID $\beta$ , and 14.7K.

74. The method of claim 73, wherein the adenovirus vector lacks expression of each of gp19K, RID $\alpha$ , RID $\beta$ , and 14.7K.

75. The method of claim 74, wherein the adenovirus additionally lacks expression of the E3 6.7K and 12.5K proteins.

97. The method of claim 60, wherein the adenovirus vector is an Ad1, Ad2, Ad5 or Ad6 vector.

98. The method of claim 60, wherein the adenovirus vector is administered to the tumor by injection of vector intravenously or intrathecally.

99. The method of claim 60, wherein the adenovirus vector is administered to the tumor by direct injection of the tumor.

100. The method of claim 60, wherein the animal is passively immunized against the recombinant adenovirus.

101. A method for treating cancer in an animal having a tumor, the method comprising administering to the tumor an adenovirus vector wherein said adenovirus vector is replication-competent in neoplastic cells and overexpresses an adenovirus death protein (ADP).

102. A method for treating cancer in an animal having a tumor, the method comprising administering to the tumor an adenovirus vector wherein said adenovirus vector is replication-competent in neoplastic cells and overexpresses an adenovirus death protein (ADP), wherein overexpression is effected by one of more of the following modifications:

- a) the ADP is expressed from an ADP coding sequence positioned under the control of a promoter other than the endogenous promoters for ADP;
- b) the adenovirus vector comprises a deletion in the E3 region that removes a splice site for an E3 mRNA;
- c) the ADP is expressed from an ADP coding sequence flanked by a pre-mRNA splicing and cleavage/polyadenylation signal other than the pre-mRNA splicing and cleavage/polyadenylation signal normally associated with the ADP gene, and/or
- d) the ADP is expressed from an ADP coding sequence that is positioned downstream of the coding sequence for another adenovirus mRNA, together with a sequence on the 5' side of the ADP coding sequence that allows for internal initiation of translation of ADP.

103. The method of claim 32, wherein the overexpression relative to a control virus is detectable by western blot

104. The method of claim 32, wherein the overexpression relative to a control virus is detectable by cell lysis

105. The method of claim 32, wherein the overexpression relative to a control virus is detectable by virus release

106. The method of claim 32, wherein the overexpression relative to a control virus is detectable by a cell spreading assay.

107. The method of claim 60, wherein the animal is a human.

108. The method of claim 13, wherein the animal is a human.

# A Novel Three-Pronged Approach to Kill Cancer Cells Selectively: Concomitant Viral, Double Suicide Gene, and Radiotherapy

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JEFF D. GILBERT, and JAE HO KIM

## ABSTRACT

Two obstacles limiting the efficacy of nearly all cancer gene therapy trials are low gene transduction efficiencies and the lack of tumor specificity. Recently, a replication-competent, E1B-attenuated adenovirus (ONYX-015) was developed that could overcome these limitations, because it was capable of efficiently and selectively destroying tumor cells lacking functional p53. In an attempt to improve both the efficacy and safety of this approach, we constructed a similar adenovirus (FGR) containing a cytosine deaminase (CD)/herpes simplex virus type-1 thymidine kinase (HSV-1 TK) fusion gene, thereby allowing for the utilization of double-suicide gene therapy, which has previously been demonstrated to produce significant antitumor effects and potentiate the therapeutic effects of radiation. The FGR virus exhibited the same tumor cell specificity and replication kinetics as the ONYX-015 virus *in vitro*. Importantly, both the CD/5-FC and HSV-1 TK/GCV suicide gene systems markedly enhanced the tumor cell-specific cytopathic effect of the virus, and, as expected, sensitized tumor cells to radiation. By contrast, neither the FGR virus nor either suicide gene system showed significant toxicity to normal human cells. Both suicide gene systems could be used to suppress viral replication effectively, thereby providing a means to control viral spread. The results support the thesis that the three-pronged approach of viral therapy, suicide gene therapy, and radiotherapy may represent a powerful and safe means of selectively destroying tumor cells *in vivo*.

## OVERVIEW SUMMARY

In this study, we examine the hypothesis that expression of a CD/HSV-1 TK fusion gene may improve both the efficacy and safety of cancer therapies involving replication-competent, E1B-attenuated adenoviruses. Both the CD/5-FC and HSV-1 TK/GCV suicide gene systems markedly enhanced the tumor cell-specific cytopathic effects of such viruses and sensitized tumor cells to radiation. Neither the virus nor the suicide gene systems showed significant toxicity to normal human cells. Both suicide gene systems were effective at suppressing viral replication, thereby providing a safety mechanism to halt virus spread. We propose that the three-pronged approach of viral therapy, suicide gene therapy, and radiotherapy may ultimately prove to be a safe and effective means of selectively destroying tumor cells *in vivo*.

## INTRODUCTION

**D**ESPITE ADVANCES IN BOTH diagnosis and therapy, the annual number of cancer-related deaths has not decreased during the past 60 years. Although conventional cancer therapies (surgery, radiotherapy, chemotherapy) produce a high rate of cure for patients with early-stage disease, many cancers recur and the majority of patients with advanced cancer eventually succumb to the disease. The limitations of conventional cancer therapies do not derive from their inability to ablate tumor, but rather from limits on their ability to do so without excessively damaging the patient. It is this consideration that constrains the extent of surgical resection, the dose of radiation and volume to be irradiated, and the dose and combination of chemotherapeutic drugs. Improving the effectiveness of a treatment is of no clinical value if there is no significant increase

in the differential response between tumor and normal tissue (*i.e.*, the therapeutic index).

As a means of increasing the therapeutic index, several new approaches involving gene therapy are under development. One of these approaches, suicide gene therapy, involves the transfer and expression of nonmammalian genes encoding enzymes that convert nontoxic prodrugs into toxic antimetabolites. Two suicide genes currently being tested in clinical trials are the *Escherichia coli* cytosine deaminase (CD) and herpes simplex type-1 thymidine kinase (HSV-1 TK) genes, which confer sensitivity to 5-fluorocytosine (5-FC) and ganciclovir (GCV), respectively (DeClercq, 1984; Calabresi and Chabner, 1990). The rationale behind the suicide gene therapy approach is that, following targeted transfer of these genes to the tumor site, only the tumor and neighboring cells (via bystander effects) will be rendered sensitive to their cytotoxic action. Thus, with this approach, systemic toxicity commonly associated with, and a major limitation of, conventional chemotherapy [*e.g.* 5-fluorouracil (5-FU)] is avoided. We (Rogulski *et al.*, 1997b) and others (Moolten and Wells, 1990; Moolten, 1994; Ezzeddine *et al.*, 1991; Culver *et al.*, 1992; Mullen *et al.*, 1992, 1994; Huber *et al.*, 1993, 1994; Takamiya *et al.*, 1993; Chen *et al.*, 1994; Hirschowitz *et al.*, 1995; Richards *et al.*, 1995; Cool *et al.*, 1996; Dong *et al.*, 1996; Ohwada *et al.*, 1996) have demonstrated the efficacy and safety of suicide gene therapy in animal models. Using retrovirally transduced cells, we have achieved 100% regression of very large intramuscular tumors (3 cm<sup>3</sup>) using the CD/5-FC and HSV-1 TK/GCV systems simultaneously with no side effects (Rogulski *et al.*, 1997b). It is noteworthy that the size of these experimental tumors is within the range of those observed in human cancer patients. These results give us reason to believe that the suicide gene therapy approach could be efficacious against some human tumors providing that the genes can be delivered efficiently to the tumor site. Unfortunately, a current limitation of nearly all cancer gene therapy approaches is that the efficiency at which therapeutic genes can be delivered *in vivo* is too low to make them efficacious against most human cancers.

A novel approach with much potential is the use of replication-competent, mutant adenoviruses that preferentially replicate in tumor cells (Bischoff *et al.*, 1996; Heise *et al.*, 1997). The prototype ONYX-015 is a replication-competent mutant adenovirus that fails to express the 55-kD E1B protein, which binds to and inactivates the cellular tumor suppressor p53 (Yew and Burke, 1992). As a result, this virus replicates in, and preferentially kills, cells lacking functional p53. The strength of this approach is that it exploits a major biological difference between normal and tumor cells, which should result in an increase in the therapeutic index. Moreover, the replication capacity of the virus should dramatically increase the efficiency of its antitumor effect. However, despite its noted strengths, this approach has limitations. For example, there is no reason to think that E1B-attenuated viruses, such as ONYX-015, could selectively destroy tumors cells containing functional p53. This point may be important, because many human tumors exhibit significant intratumoral heterogeneity with respect to p53 status (Mirchandani *et al.*, 1995; Yang *et al.*, 1996). Because adenoviruses are immunogenic, this approach will elicit an immunological response that may not only attenuate its antitumor effects, but may also preclude repeated doses. Finally, the ability of the virus to replicate, albeit ineffi-

ciently, in normal human cells, may raise concerns regarding the safety of this approach. Thus, it would be desirable to combine this approach with one that could (i) expand the spectrum and tumor cell types that it would be effective against, (ii) increase its therapeutic efficacy per dose, and (iii) control the replication and spread of the virus.

With these goals in mind, we developed a replication-competent, E1B-attenuated adenovirus similar to ONYX-015 that contains a CD/HSV-1 TK fusion gene. We demonstrate here that this virus exhibits all the advantages of the ONYX-015 virus, but in addition, is improved significantly in both efficacy and safety.

## MATERIALS AND METHODS

### *Plasmids, viruses, antibodies, and cell lines*

All plasmids containing adenoviral sequences used in the construction of a replication-competent, E1B-attenuated adenovirus containing a CD/HSV-1 TK fusion gene (FGR) were obtained from Microbix (Toronto, Canada). Construction and characterization of the CD/HSV-1 TK fusion gene has been previously described (Rogulski *et al.*, 1997a). Wild-type adenovirus type 5 and ONYX-015 were obtained from ONYX Pharmaceuticals (Richmond, CA). U251, DU145, PC-3, HT29, and MRC-5 cells were obtained from the American Type Culture Collection (ATCC). 293 cells were obtained from Microbix. Antibodies to the adenovirus type 2 E1A (sc-430) and 55-kD E1B (DP08) proteins were obtained from Calbiochem (LaJolla, CA).

### *Construction of FGR and production of adenoviruses*

The wild-type E1 region from bases 343 to 2,270 was generated by the polymerase chain reaction (PCR) using pXC1 (Microbix) as template. The resulting 1,928-bp fragment contained *Bam* HI restriction sites at each end, a *Bgl* II restriction site 5' to the 3' *Bam* HI site, and two mutations at bases 2,253 (C → T) and 2,262 (G → T) generating premature translation stop codons in the 55-kD E1B reading frame at codons 79 and 82, respectively. The PCR fragment was digested with *Bam* HI and cloned into the 6.4kb fragment of pCA14 (Microbix) generating pCA14-E1aE1b. The CD/HSV-1 TK fusion gene was removed from pWZLneoCDglyTK (Rogulski *et al.*, 1997a) by a partial *Bam* HI-*Eco* RI digestion and cloned between the *Bam* HI and *Eco* RI sites of pCA14 generating pCA14-CDglyTK. The entire expression cassette, containing the cytomegalovirus (CMV) promoter, CDglyTK fusion gene and SV40 polyadenylation elements, we removed from pCA14-CDglyTK by *Bgl* II digestion. The 3.1-kb fragment was cloned into the sole *Bgl* II site of pCA14-E1aE1b generating pCA14-E1aE1b/CDglyTK. Both pCA14-E1aE1b/CDglyTK and pCA14-CDglyTK were linearized with *Pvu* I and co-transfected with *Cla* I-linearized pBHG10 (Microbix) into 293 cells to generate the FGR virus and its replication-defective counterpart (Ad5-CDglyTK). Isolated plaques were picked 10–14 days later and plaque-purified on 293 cells a second time. All viruses were propagated in 293 cells to generate crude viral supernatants (titers 20–20 × 10<sup>8</sup> pfu/ml) or CsCl gradient-purified virus (titers 5–50 × 10<sup>11</sup> pfu/ml). All viral preparations were assayed for their ability to

replicate in and lyse non-E1A-expressing cells, for genome integrity and stability by Southern blotting, and for expression of the CDglyTK fusion gene by Western blotting and immunofluorescence.

#### Western blotting

Cells ( $1 \times 10^6$ , 60-mm dish) were infected with the various crude viral supernatants at an multiplicity of infection (moi) of 10 in 0.2 ml of Dulbecco's modified Eagle's medium (DMEM). After 1 hr, fresh growth media was added. Eighteen hours post-infection, cells were lysed in Laemmli sample buffer. Samples (15  $\mu$ l) containing protein from  $3 \times 10^5$  cells were applied to a SDS-10% polyacrylamide gel and transferred to nitrocellulose using standard procedures. Blots were probed with a polyclonal antibody directed against the adenovirus type 2 E1A protein (sc-430). Antibody binding was visualized using standard chemilluminescence procedures.

#### Cytosine deaminase assays and immunofluorescence

Cells ( $1 \times 10^6$ , 60-mm dish) were harvested 48 hr post adenoviral infection. Cell extracts were prepared and cytosine deaminase (CD) assays performed as previously described (Rogulski *et al.*, 1997a). For each reaction, 50  $\mu$ g of protein was used. For CD immunofluorescence, tumors were excised, frozen, and sectioned. Samples were placed on glass slides, fixed in methanol, and washed thoroughly with phosphate-buffered saline (PBS). Samples were incubated with a polyclonal antibody to *E. coli* CD (provided by C. Richards, Glaxo-Wellcome), followed by a Texas Red-conjugated donkey anti-rabbit antibody. Samples were stained with DAPI and photographed using an Olympus fluorescent microscope.

#### Immunoprecipitation

For immunoprecipitation of the adenovirus 55-kD E1B protein, cell monolayers were incubated in 4 ml of DMEM containing 2% dialyzed fetal calf serum (FCS) and 100  $\mu$ Ci/ml [ $^{35}$ S]methionine/cysteine (ICN; TRANS $^{35}$ SLABEL; 1,439 Ci/mmol) for 2 hr beginning 16 hr post-infection. Cell monolayers were washed with PBS and lysed directly in 1 ml of RIPA buffer (9.1 mM NaHPO<sub>4</sub>, 1.7 mM NaH<sub>2</sub>PO<sub>4</sub>, 150 mM NaCl, 1% Nonidet P-40, 0.5% Na deoxycholate, 0.1% SDS pH 7.4). Cell extracts were clarified by microcentrifugation, and preabsorbed with 1  $\mu$ g of normal rabbit serum and 20  $\mu$ l of Protein A/G PLUS Agarose (Santa Cruz Biotechnology Inc.). One microgram of the monoclonal anti-55-kD E1B antibody (DP08) was added to 0.5 ml of clarified cell extract and incubated on ice for 1 hr. Twenty microliters (20  $\mu$ l) of Protein A/G PLUS Agarose was added and the sample was incubated at 4°C for 1 hr with constant mixing. The immunoprecipitates were collected by microcentrifugation and washed four times with 1 ml of RIPA buffer followed by one wash with 1 ml of PBS. The final pellet was resuspended in 40  $\mu$ l of Laemmli sample buffer, heated at 100°C for 5 min, and the agarose was pelleted by microcentrifugation. Twenty microliters of the supernatant fractions were applied to an SDS-10% polyacrylamide gel and the dried gel was subjected to autoradiography.

#### Cytopathic effect (CPE)

To compare the viral cytopathic effects, cells ( $10^5$ /well, 24-well plate) were either mock-infected, or infected with increasing moi in 0.2–0.4 ml of DMEM. After 1 hr, the virus was removed and cells were incubated in DMEM containing 10% FCS (growth medium). Duplicate plates were fixed and stained with crystal violet either 5 or 9 days post-infection. For prodrug sensitivity assays, cells ( $1 \times 10^6$ , 60-mm dish) were either mock-infected, or infected with virus at an moi of 10. After 1 hr, the cells were detached and replated ( $2 \times 10^4$  cells/well, 24-well plates) in either growth medium, or growth medium containing varying concentrations of prodrugs (GCV and/or 5-FC). The media was changed every 2 days. Duplicate plates were fixed and stained with crystal violet either 5 or 9 days later. To quantify the cytopathic effect, cells were replated in triplicate at low density ( $10^4$  and  $10^3$  cells/60-mm dish) immediately following infection. Colonies were fixed, stained with crystal violet, and counted 7–10 days later.

#### Assay for viral replication

Cells ( $1 \times 10^5$ /well, 24-well plate) were either mock-infected, or infected at an moi of 10 in 0.2 ml of DMEM. After 1 hr, the virus was removed and cells were incubated in DMEM containing 10% FCS. Cells were harvested every day thereafter by lysing them in 0.4 ml of 10 mM Tris-HCl pH 7.5, 10 mM NaCl, and 0.6% SDS. Genomic DNA was precipitated by the addition of 0.1 ml of 5 M NaCl and incubation at 4°C overnight. Following microcentrifugation, the supernatant fractions were extracted with phenol, CHCl<sub>3</sub>, and viral DNA was precipitated with ethanol. Samples were digested with *Hind* III and analyzed by Southern blotting using standard techniques. The blots were probed with [ $^{32}$ P]pBHG10 (Microbix), which detects all but the left-most *Hind* III fragment of all the viruses. To monitor prodrug inhibition of viral replication, cells ( $1 \times 10^6$ , 60-mm dish) were infected with FGR at a moi of 10 and immediately replated ( $2 \times 10^4$  cells/well, 24-well plate) in varying concentrations of prodrugs. Cells were harvested 48 hr post-infection and processed for Southern blot analysis as described above.

#### Radiosensitivity experiments

DU145 and U251 cells ( $2 \times 10^5$  cells/well, 6 well plate) were either mock-infected, or infected with FGR at a moi of 1. Cells were incubated in growth medium for 48 hr to allow for viral replication and expression of the CD/HSV-1 TK fusion gene. The medium was then replaced with normal growth medium or medium containing either 40  $\mu$ g/ml of 5-FC or 0.1  $\mu$ g/ml of GCV. After 24 hr, cells were exposed to a single dose of  $\gamma$ -irradiation (0–6 Gy). Cells were immediately replated in triplicate at low density ( $1 \times 10^4$  and  $1 \times 10^3$  cells/60-mm dish) in growth medium. Colonies were fixed, stained with crystal violet, and counted 7–10 days later. The sensitizer enhancement ratio (SER) represents the ratio between the  $D_0$  of radiation alone and the  $D_0$  for radiation plus virus and prodrugs. Cell survival data were analyzed using a nonlinear least square algorithm (Albright, 1987). Radiation cell survival curves were fit using the Single-Hit Multi-Target (SHMT) model.

## RESULTS

*Characterization of replication-competent, E1B-attenuated adenovirus containing CD/HSV-1 TK fusion gene*

A schematic representation of the E1 region of our replication-competent, E1B-attenuated adenovirus containing the CD/HSV-1 TK fusion gene (FGR) is shown in Fig. 1. Expression of the CDglyTK gene (Rogulski *et al.*, 1997a) is driven by the human CMV promoter and utilizes simian virus 40 (SV40) polyadenylation elements. The entire expression cassette is situated within an intron in the adenovirus E1B region immediately downstream of the 19-kD E1B gene. FGR expresses the wild-type adenovirus type 5 E1A and 19-kD E1B proteins. Two premature translation stop codons were placed in the 55-kD E1B gene that would result in the production of a truncated 78-amino acid protein. This truncated protein does not contain the p53 binding domain (amino acids 215–354, Yew and Burke, 1992; Kao *et al.*, 1990), and therefore cannot interact with p53. FGR also contains a 2.68-kb deletion in the E3 region (bases 28,133–30,181).

To demonstrate that FGR had the expected properties, virus-infected DU145 prostate adenocarcinoma cells were examined

for expression of the E1A and 55-kD E1B proteins, virus replication, and CD activity (*i.e.*, expression of the CDglyTK fusion protein). FGR produced similar amounts of the E1A proteins as wild-type adenovirus type 5 and ONYX-015 (Fig. 2A). However, like ONYX-015, it failed to express the 55-kD E1B protein (Fig. 2B). FGR replicated in DU145 cells with kinetics similar to that of wild-type adenovirus and ONYX-015 (Fig. 2C); however, it and ONYX-015 replicated slightly slower than wild-type virus in most other tumor cell types examined (*e.g.*, U251, HT-29; not shown). The titer (pfu) of virus produced in one cycle "burst" assays correlated well with the steady-state levels of viral DNA observed in the Southern blots (not shown). The replicative capacity of FGR subsequently resulted in high expression of the CDglyTK fusion protein as determined by CD assays. Seventy-two hours post-infection, FGR expressed the CDglyTK protein at a level 50-fold greater than a stably, retrovirally transduced cell line and 300-fold greater (after correcting for differences in moi) than cells infected with Ad5-CDglyTK, a replication-defective version of FGR (Fig. 2D). This clearly illustrates the advantage of a replication-competent adenovirus over a nonreplicating adenovirus (*i.e.*, greater therapeutic gene expression per dose).

To demonstrate that FGR, like ONYX-015, preferentially

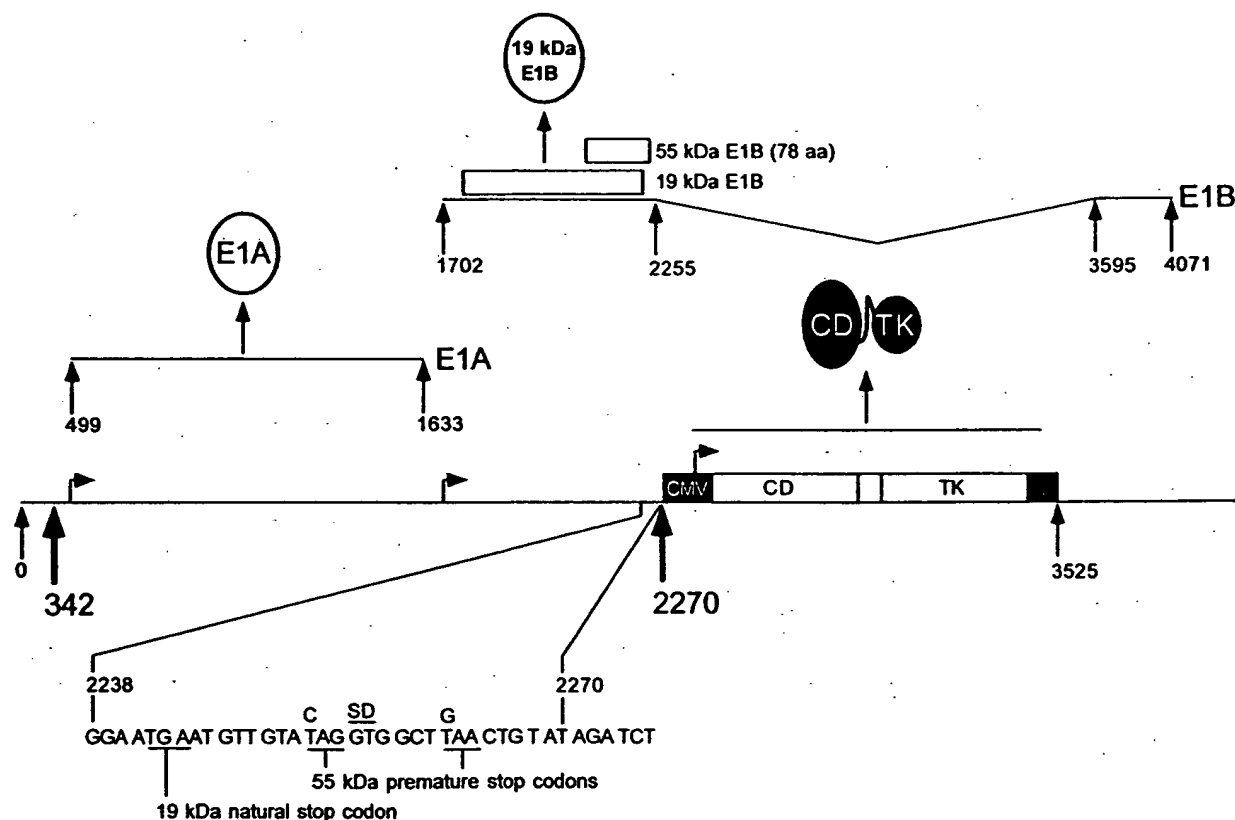
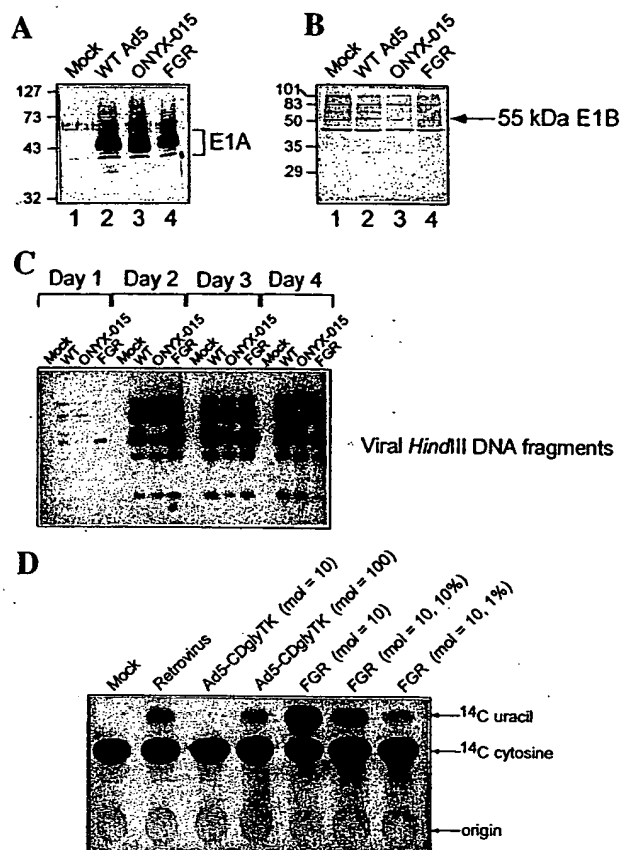


FIG. 1. Schematic representation of the E1 region of FGR. All numbers indicate base positions of the wild-type adenovirus type 5 sequence. The natural 19-kD E1B translation stop codon and the two engineered premature stop codons in the 55-kD E1B reading frame are indicated. Horizontal arrows indicate E1A, E1B, and CMV transcription initiation sites. The caret indicates the intron in the E1B region into which the CD/HSV-1 TK expression cassette was cloned. Solid black boxes in the CD/HSV-1 TK fusion gene represent the CMV promoter or SV40 polyadenylation elements, and the open box indicates the region coding for the polyglycine linker. SD, Splice donor site.



**FIG. 2.** Characterization of FGR. **A.** Expression of adenovirus E1A proteins. DU145 cells were either mock-infected, or infected with virus at an moi of 10. Cells were harvested 18 hr later and examined for E1A expression by Western blotting. The migration of the E1A proteins is indicated. Numbers on the left indicate molecular weight markers in kilodaltons. **B.** Expression of adenovirus 55-kD E1B protein. DU145 cells were either mock-infected, or infected with virus at an moi of 10. Cells were labeled with [ $^{35}$ S]methionine, and the 55-kD E1B protein was immunoprecipitated from cell extracts. Immunoprecipitates were analyzed on a SDS-10% polyacrylamide gel. The migration of the 55-kD E1B protein is indicated. Numbers on the left indicate molecular weight markers in kilodaltons. **C.** Comparison of viral replication. DU145 cells were either mock-infected or infected with virus at an moi of 10. Cells were harvested every day thereafter, and low-molecular-weight DNA was isolated. DNA was digested with *Hind* III and subjected to Southern blot analysis. The  $^{32}$ P-labeled probe contained adenovirus type 5 sequences from base 1,340 to the right end and detects all but the left hand-most *Hind* III fragment of the viruses. **D.** Comparison of CD expression among various viruses. DU145 cells were either mock-infected, or infected with FGR at an moi of 10 or a replication-defective version of FGR (Ad5-CDglyTK) at moies of 10 and 100. Cells were harvested 72 hr later and examined for CD activity. All CD assays contained 50  $\mu$ g of protein, except for FGR (moi = 10, 10%) and FGR (moi = 10, 1%), which contained 5  $\mu$ g and 0.5  $\mu$ g, respectively. For comparison, CD expression in adenovirus-infected cells is compared to a pooled, G418-selected DU145 cell line (retrovirus) that expresses the CDglyTK fusion protein from a stably integrated murine provirus (Rogulski *et al.*, 1997a). The [ $^{14}$ C]uracil product and [ $^{14}$ C]cytosine substrate are indicated. The transduction efficiency of DU145 cells at the various moies are as follows: Ad5-CDglyTK, moi = 10, 20–30%; Ad5-CDglyTK, moi = 100, 100%; FGR, moi = 10, 20–30%.

killed tumor cells lacking functional p53, DU145 (human prostate adenocarcinoma, mutant p53), U251 (human glioblastoma, mutant p53), and MRC-5 cells (human diploid fibroblasts, wild-type p53) were infected with graded doses of ONYX-015 and FGR and the resulting cytopathic effect was scored 9 days later (Fig. 3). FGR lysed DU145 and U251 cells with efficiencies identical to ONYX-015. DU145 cells were more sensitive to both viruses than U251 cells. By contrast, both viruses produced only minimal cytopathic effects with MRC-5 cells (at high moies and after prolonged periods). Thus, FGR (and ONYX-015) is able to kill tumor cells containing mutant p53 under conditions where it demonstrates no cytopathic effect on normal cells.

#### *Enhancement of the viral cytopathic effect by the CD/5-FC and HSV-1 TK/GCV suicide gene systems*

To determine whether the CD/5-FC and HSV-1 TK/GCV suicide gene systems could enhance the viral cytopathic effect, cells were infected with FGR and exposed to increasing concentrations of 5-FC, GCV, or both 5-FC and GCV. The cytopathic effect was scored qualitatively by staining cells 5–9 days post-infection and quantitatively by clonogenic assays. For U251 cells, both the CD/5-FC and HSV-1 TK/GCV systems increased the cytopathic effect of the virus in a prodrug concentration-dependent manner (Fig. 4A, top). Whereas FGR alone consistently produced about 1 log cell kill in clonogenic assays, 5-FC ( $\geq 50$   $\mu$ g/ml) and GCV ( $\geq 0.5$   $\mu$ g/ml) each increased the cytotoxic effect by an additional log (Fig. 4B). The effect of FGR on DU145 cells was so potent that it masked the cytopathic effects of the suicide gene systems (not shown). Therefore, we performed similar experiments using another well-characterized human prostate adenocarcinoma cell line, PC-3 (null p53), which is rather resistant to both FGR and ONYX-015. Similar to U251 cells, the CD/5-FC suicide gene system dramatically increased the observed cytopathic effect relative to that of FGR alone (Fig. 4A, middle). However, no increase was observed with the HSV-1 TK/GCV system up to concentrations of 1.0  $\mu$ g/ml GCV. Thus, at least one suicide gene system was able to elicit a pronounced cytopathic effect with a tumor cell line that is very resistant to these lytic viruses. Similar results were obtained with the human glioblastoma line LN-Z308 (null p53), which also proved to be resistant to these lytic viruses (not shown). Importantly, when used independently, neither suicide gene system had any significant effect on MRC-5 cells except at the highest (100  $\mu$ g/ml) 5-FC concentration used (Fig. 4A, bottom).

#### *CD/5-FC and HSV-1 TK/GCV suicide gene systems markedly inhibit viral replication*

Because both the CD/5-FC and HSV-1 TK/GCV systems exert their cytotoxic effect by inhibiting DNA replication either directly (HSV-1 TK/GCV) or indirectly (CD/5-FC), we examined whether these systems could be used to inhibit viral replication. Shortly after FGR infection, cells were plated in increasing concentrations of prodrugs and adenoviral DNA was isolated 2 days later and subjected to Southern blot analysis (Fig. 5). Both suicide gene systems markedly inhibited viral replication. However, in all cell lines tested (U251, DU145, HT29), the HSV-1 TK/GCV system was approximately 1,000-fold more effective on a prodrug concentration basis. This may, in part, be explained



by the fact that the HSV-1 TK/GCV system inhibits DNA replication directly at the level of chain elongation, whereas the CD/5-FC system depletes dTMP precursor pools. Interestingly, a dramatic enhancement of the viral cytopathic effect was observed (Fig. 4A) even at prodrug concentrations that markedly inhibited replication of the virus (for U251 cells:  $\geq 50$   $\mu\text{g/ml}$  5-FC and  $\geq 0.1$   $\mu\text{g/ml}$  GCV). These results argue that in such cases, the cytopathic effect due to the suicide gene systems is much more potent than that of the virus itself.

### Radiosensitization by FGR and prodrugs

Previously, we demonstrated that the CD/5-FC and HSV-1 TK/GCV suicide gene systems could, independently, potentiate the killing effects of radiation *in vitro* (Kim *et al.*, 1994, 1995, 1997; Khil *et al.*, 1996; Rogulski *et al.*, 1997a) and *in vivo* (Rogulski *et al.*, 1997b) (*i.e.*, radiosensitivity). Even greater radiosensitivity was observed when both suicide gene systems were used together (Rogulski *et al.*, 1997a). A tremendous strength of the combined suicide gene therapy/radiotherapy approach is that because neither prodrug (5-FC and GCV) is toxic and it is possible to focus a radiation beam on a very small area in three-dimensional space, it allows for a high degree of tumor cell kill while minimizing damage to normal tissues. Thus, we examined whether these suicide gene systems, when used in the context of a replicating adenovirus, could radiosensitize tumor cells *in vitro*. It is important to note that, because these experiments would employ up to three modalities—viral therapy, suicide gene therapy, and radiotherapy—each of which when used independently under optimal conditions can generate between 1 and 4 logs of cell kill depending on the cell type, it was necessary to use suboptimal amounts of virus and prodrugs to be able to quantify the radiosensitization effect. Thus, the effects described below are likely to represent only a fraction of what could be achieved under optimal conditions.

DU145 and U251 cells were either mock-infected, or infected with FGR at an moi of 1. Two days later, they were exposed to 40  $\mu\text{g/ml}$  5-FC or 0.1  $\mu\text{g/ml}$  GCV for 24 hr. Cells then received a single dose of  $\gamma$ -irradiation (0–6 Gy) and were immediately replated for clonogenic assays. Nine days later, colonies were scored and cell survival curves generated. A change in the slope of the cell survival curve relative to radiation alone indicates radiosensitization.

Both the CD/5-FC and HSV-1 TK/GCV suicide gene systems radiosensitized DU145 and U251 cells (Fig. 6A,B), yielding sensitivity enhancement ratios (SERs) in the range of 1.6–3.1. By contrast, FGR alone resulted in no radiosensitization, indicating that the combined toxic effects of the replicating virus and radiation are additive. Thus, even under suboptimal conditions, both suicide gene systems could, in a synergistic manner, enhance the killing effects of radiation when expressed in the context of a replicating adenovirus.

### FGR infection of tumors *in vivo*

To estimate the efficiency at which FGR could infect and spread in tumors, HT-29 tumors (human colon adenocarcinoma, mutant p53) were injected with FGR and tumors

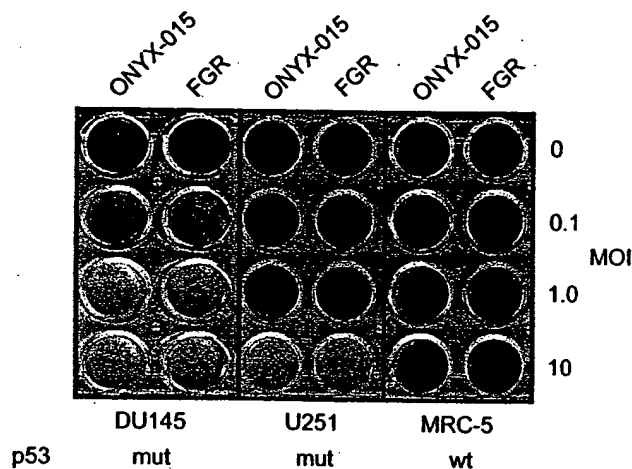
were excised and examined for CD expression by immunofluorescence. Although the level of CD expression varied from cell to cell, the results demonstrated that approximately 20–30% of tumor cells expressed the CD gene product (Fig. 7). As expected, the highest CD expression occurred in cells surrounding the injection site. Similar results were obtained with U251 tumors (human glioblastoma, mutant p53; not shown). Thus, it is possible to achieve significant infection of tumor cells *in vivo* using relatively small amounts of the FGR virus.

## DISCUSSION

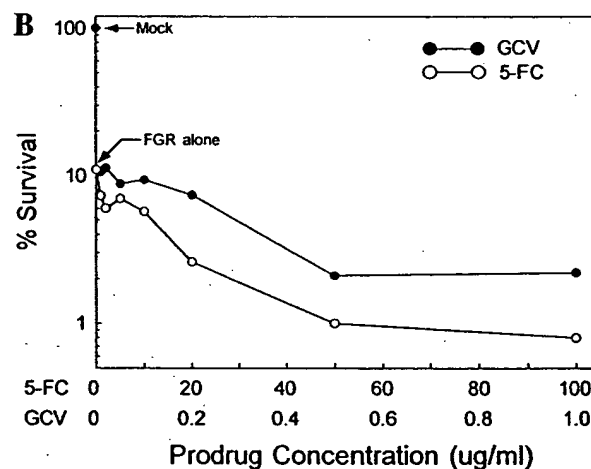
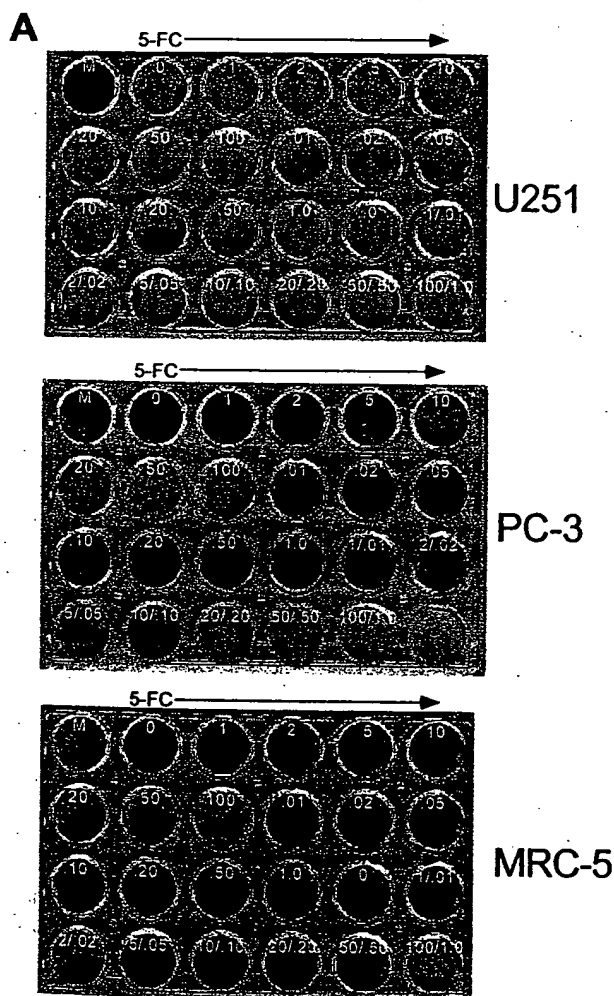
The results presented here demonstrate that suicide gene therapy can enhance the therapeutic effects of viral therapy in a tumor cell-specific manner. The therapeutic effect of these combined modalities can be further enhanced by coupling them with radiotherapy. Although it was not possible to quantify the effectiveness of this three-pronged approach under optimal conditions *in vitro*, it is noteworthy that each modality alone can achieve between 1 and 4 logs of cell kill under optimal conditions depending on the tumor cell type. Thus, even if the combined cytotoxic effects of these modalities was simply additive under optimal conditions, it should be possible to achieve very significant cell kill when these three modalities are used simultaneously. That suicide gene therapy and radiotherapy interact to produce a synergistic enhancement of cell kill may make the combined therapeutic effect even greater. Thus, the three-pronged approach described here (Fig. 8) may prove to be a very powerful means of destroying cancer cells *in vivo*.

Despite its potential, however, improving the effectiveness of a treatment is of no clinical value if there is no significant increase in the therapeutic index, the differential response between tumor and normal tissue. When taking this important point into consideration, the three-pronged approach described here fares well. As demonstrated previously (Bischoff *et al.*, 1996; Heise *et al.*, 1997) and here, the use of an E1B-attenuated adenovirus allows for the preferential targeting of tumor cells lacking functional p53. Thus, the viral cytopathic effect, although not restricted to tumor cells lacking functional p53, is preferentially observed in such cells relative to normal cells. Although the suicide gene systems do not specifically target tumor cells, they do target replicating cells and, importantly, unlike conventional chemotherapy, neither prodrug produces significant systemic toxicity in humans. Finally, with three-dimensional conformal radiotherapy, it is possible to deliver high doses of radiation specifically to a tumor site while minimizing the exposure to surrounding tissues. On the basis of these premises, we believe the three-pronged approach described here may generate a significant increase in the therapeutic index when used in the clinic.

Nearly all gene therapy protocols undergoing clinical trials today are limited by low *in vivo* gene transduction efficiencies. Although several approaches using replication-defective retroviruses or adenoviruses have produced encouraging results in animal models, it is unlikely that these approaches will have the gene transduction efficiencies necessary for them to be ef-



**FIG. 3.** Comparison of ONYX-015 and FGR cytopathic effects. Cells were either mock-infected (moi = 0), or infected with virus at the mois indicated. Cells were fixed and stained with crystal violet 9 days later.



**FIG. 4.** Enhancement of the viral cytopathic effect by the suicide gene systems. Cells were either mock-infected (M), or infected with FGR at an moi of 10. Cells were detached and replated in triplicate at high (A) or low (B) densities in varying concentrations of 5-FC, GCV, or 5-FC + GCV (5-FC/GCV). Cells were fixed and stained with crystal violet 5–9 days later. Numbers at the top of each well in A indicate prodrug concentration in  $\mu\text{g/ml}$ . Results of U251 cell clonogenic assays are shown in B.

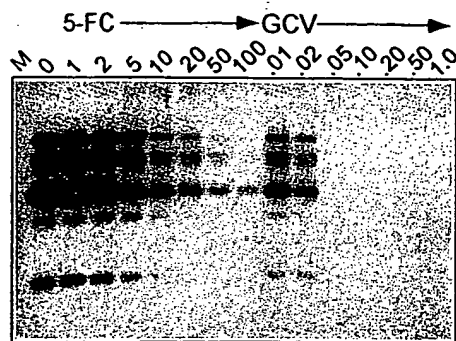
Viral *Hind*III DNA fragments

FIG. 5. Inhibition of virus replication by suicide gene systems. Cells were either mock-infected (M), or infected with FGR at an moi of 10. Cells were detached and replated in varying concentrations of prodrugs. Cells were harvested 48 hr later for isolation of low-molecular-weight DNA. DNA was digested with *Hind* III and analyzed by Southern blotting as described in Fig. 2C.

fective against the large tumoral masses commonly observed in human cancer patients. Moreover, because few human cancers are curable with a single modality, it has been our tenet that the promise of cancer gene therapy will be realized only when used in combination with other modalities, such as the ones described here. We believe the three-pronged approach described here may improve not only the specificity (discussed above), but also the efficacy, of the cancer gene therapy approach. Relative to a replication-defective virus, the replication capacity of FGR should result in a markedly greater efficiency of gene transfer *in vivo* as well as higher transgene expression per tumor cell. Indeed, we have observed that FGR is able to produce up to

2,000-fold more CD activity in infected cells than a replication-defective version from which FGR was derived (after correcting for differences in mois). This should result in a greater therapeutic effect per dose than that obtainable with replication-defective viruses. It is possible that the high *in vivo* gene transduction efficiencies observed with replication-competent adenoviruses may enable this approach to be efficacious against disseminated disease (Heise *et al.*, 1997).

Another potential strength of the approach described here is that both suicide gene systems proved to be effective at inhibiting viral replication *in vitro* at prodrug concentrations that are safely achievable in humans. Although it is uncertain

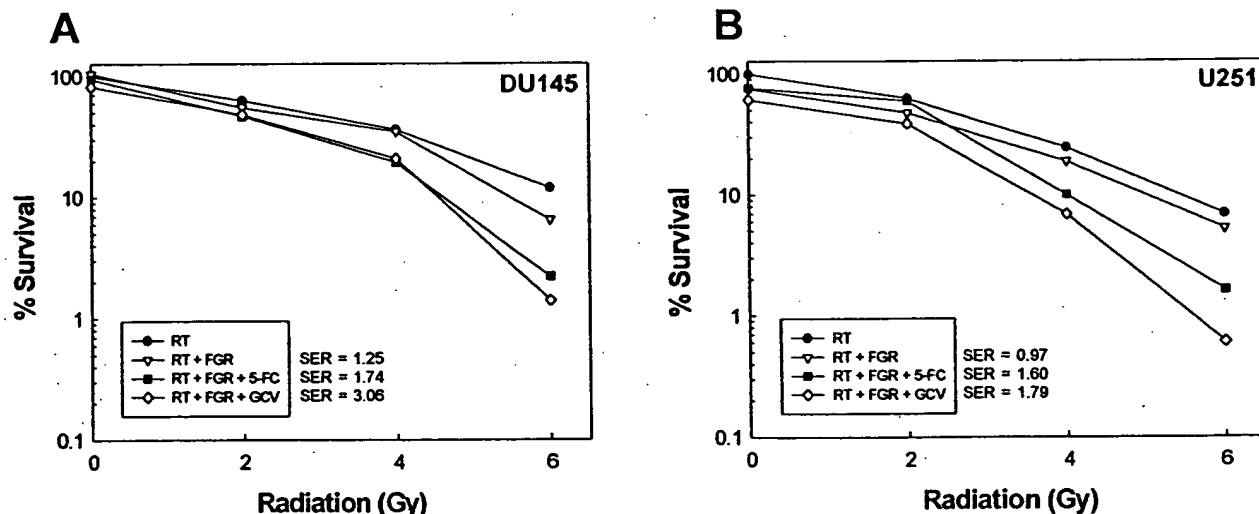
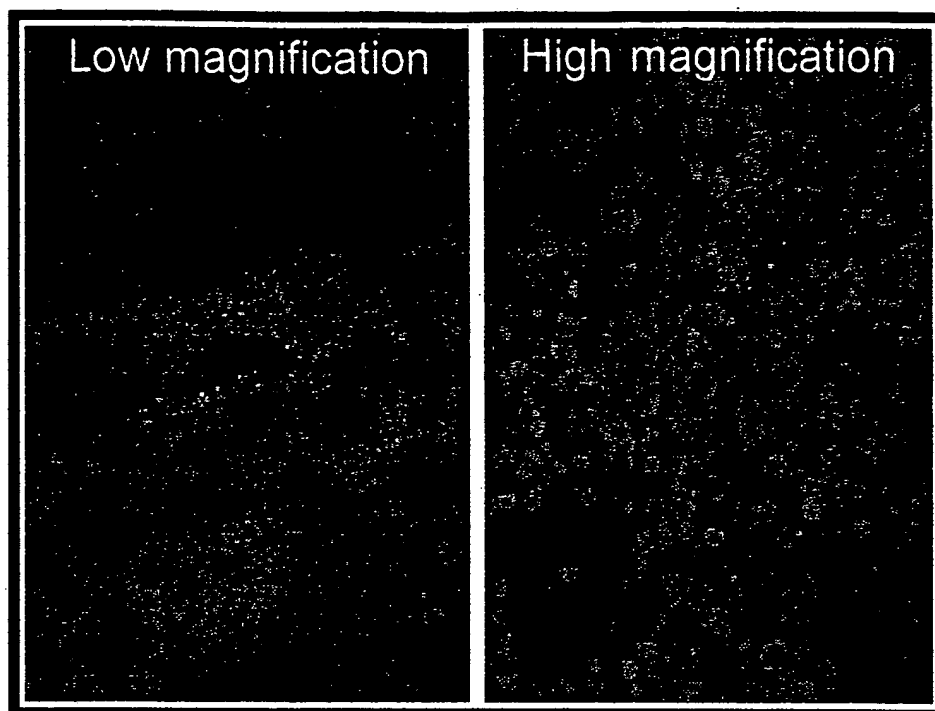
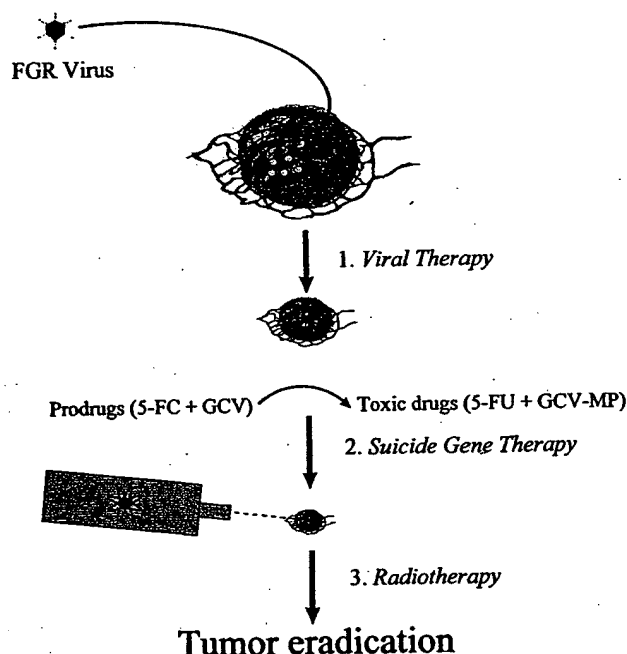


FIG. 6. Radiosensitization by the suicide gene systems. DU145 (A) and U251 (B) cells were either mock-infected (●), or infected with FGR at a moi of 1. Forty-eight hours later, cells were incubated in growth medium without (▽), or with, prodrugs at 40  $\mu$ g/ml 5-FC (■) or 0.1  $\mu$ g/ml GCV (◇) for 24 hr. Cells were then exposed to a single dose of  $\gamma$ -irradiation (0–6 Gy) and replated in triplicate for clonogenic assays. Colonies were fixed, stained with crystal violet, and counted 7–10 days later. The SER represents the ratio between the  $D_0$  of radiation alone (RT) and the  $D_0$  for radiation plus FGR without (RT + FGR), or with (RT + FGR + 5-FC, RT + FGR + GCV), prodrugs. The radiosensitization experiments were performed twice and the SERs varied less than 10% between experiments.



**FIG. 7.** FGR infection of tumor cells *in vivo*. HT-29 tumors ( $0.2 \text{ cm}^3$ ) were injected with  $10^8$  pfu ( $50 \mu\text{l}$ ) of FGR on 5 consecutive days. Two days after the last injection, tumors were excised, sectioned, and processed for immunofluorescence. Samples were photographed at a magnification of  $25\times$  (left) and  $125\times$  (right). Cells that are positive for CD expression appear red. Nuclei were stained with DAPI and are blue.



**FIG. 8.** Schematic diagram of three-pronged approach. The FGR virus itself (prong 1) replicates in and preferentially kills tumor cells expressing mutant p53 resulting in significant, and selective, tumor cell destruction. Co-utilization of the CD/5-FC and HSV-1 TK/GCV suicide gene systems (prong 2) markedly enhance the therapeutic effects of the FGR virus and, importantly, sensitize tumors to radiation (prong 3). The replication potential of the FGR virus enhances both the efficiency of gene transduction (percentage of tumor cells (infected) as well as the steady-state level of transgene expression per cell.

whether uncontrolled viral spread will prove to be a drawback of this approach, having the potential to eliminate the virus, if necessary, is an asset. These observations also make it likely that following injection of the virus, both the timing and dose of prodrug administration will be critical parameters in determining the therapeutic outcome. Indeed, results from our ongoing animal studies support this notion. Thus, inclusion of the CD/HSV-1 TK fusion gene in a lytic, replication-competent adenovirus may not only improve the efficacy, but also the safety, of this cancer gene therapy approach.

There is perhaps one additional advantage of the three-pronged approach described here. Although the use of an E1B-attenuated adenovirus, such as ONYX-015, allows for the preferential destruction of tumor cells lacking functional p53, its inability to destroy tumor cells selectively with normal p53 is a weakness. Moreover, we have observed that some human tumor cell lines are resistant to these lytic viruses. These weaknesses may prove to be significant as many human tumors show intratumoral heterogeneity with respect to p53 status (Mirchandani *et al.*, 1995; Yang *et al.*, 1996) and the efficacy of this approach may vary widely among tumor types. Thus, a better approach might be one that could selectively destroy tumor cells lacking, or containing, functional p53, and yet inflict minimal damage on surrounding normal cells. Indeed, FGR, when used in conjunction with prodrug and radiation therapy, may meet such criteria. It has been previously demonstrated that tumor cells with normal p53 status are more sensitive to the cytotoxic effects of chemotherapeutic drugs, such as 5-FU, and radiation than tumor cells lacking functional p53 (Lowe *et al.*, 1993, 1994). The heightened sensitivity of tumor cells with normal p53 is thought to be due to their increased propensity to undergo p53-mediated apoptosis following injury.

Because our three-pronged approach employs both chemotherapy and radiotherapy, it is possible that FGR, when combined with these modalities, may selectively destroy both tumor cell types. Whereas the viral cytopathic effect should selectively target tumor cells lacking functional p53, the suicide gene systems, via their bystander effects, and radiotherapy should preferentially target those containing functional p53. Importantly, this approach should inflict minimal damage on surrounding normal cells because such cells are less likely to be replicating (and therefore resistant to suicide gene therapies) and normal cells tend to undergo p53-mediated growth arrest, not apoptosis, following insult by chemotherapeutic drugs and/or radiation (Lowe *et al.*, 1993). Thus, utilization of the suicide gene systems should not significantly weaken the specificity of the "tumor-specific" E1B-attenuated adenoviruses. We have already demonstrated that FGR, in conjunction with 5-FC prodrug therapy, is able to kill effectively tumor cells that are resistant to lytic viruses such as ONYX-015 and FGR.

Thus, it is likely that the three-pronged approach described here will prove to be a significant improvement over ONYX-015 because the three modalities may target different tumor cell types or subpopulations, which, in turn, should expand the spectrum of human tumors that it will be effective against. Indeed, our ongoing studies in animals have confirmed that the addition of double suicide gene therapy significantly improves the antitumor effects (*i.e.*, tumor growth delay and tumor cure) of E1B-attenuated, replication-competent adenoviruses.

## ACKNOWLEDGMENTS

We thank our colleagues for their help and insight. We thank Dr. C. Heise (ONYX) for providing wild-type adenovirus type 5 and ONYX-015. This work was supported by grants from the National Institutes of Health and ACS to SOF and JHK (CA64295, CA75456, CA64323, EDT-110).

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of:	Wold et al.	Group No.:	1632
Serial No.:	09/351,778	Atty. Docket No.:	66153-7775
Filed:	07/12/1999		
For:	Replication-Competent Anti-Cancer Vectors	Examiner:	Priebe, Scott David

**DECLARATION, PURSUANT TO 37 C.F.R. §1.131,**  
**OF WILLIAM S.M. WOLD, Ph.D., ANN E. TOLLEFSON, Ph.D., KONSTANTIN**  
**DORONIN, Ph.D. AND KAROLY TOTH, D.V.M.**

We, William S.M. Wold, Ph.D., Ann E. Tollefson, Ph.D., Konstantin Doronin, Ph.D. and Karoly Toth, D.V.M., declare and state as follows:

1. All of the statements made herein of our own knowledge are true and all statements made on information and belief are believed to be true.
2. We are co-inventors of the inventions described and claimed in the above referenced patent application, filed July 12, 1999.
3. We conceived of a recombinant adenovirus vector which is replication-competent in neoplastic cells and which overexpresses an adenovirus death protein prior to March 3, 1997. We worked diligently, continuously and uninterrupted from prior to March 3, 1997, until we reduced the recombinant adenovirus to practice. The information contained in the documents of the attached exhibits was contemporaneously recorded on the dates indicated therein. Further, those exhibits are

true copies of the originals except to the extent that certain sensitive dates have been redacted. All noted dates that have not been redacted are accurate.

4. Claim 1 of the '778 application is directed to a recombinant adenovirus vector that is replication-competent in neoplastic cells and that overexpresses adenovirus death protein (ADP).

5. On or before March 3, 1997, we conceived of a recombinant adenovirus vector that is replication-competent in neoplastic cells and that overexpresses ADP, as evidenced by the activities set forth below. Unless otherwise noted, all of the documents referred to in the bullet point sections below are dated prior to March 3, 1997:

- Our early work focused on the E3 transcription unit (also referred to as the E3 region) of Adenovirus (Ad), and understanding the function of the various proteins encoded by that region. We observed that Ad comprising an ADP (11.6K) mutation (i.e. a mutation in the gene coding for ADP) developed plaques slower, and that those plaques were smaller, than Ad with wild type levels of ADP expression (see Exhibit A, page 1 [A1], where dl712 is an ADP mutant and Ad5 is a wild-type adenovirus).
- In addition, we observed that some mutant Ads that have portions of the E3 region deleted, other than the gene for ADP, produced larger plaques than the wild-type Ad. See page 2 of Exhibit A (page A2), which is a notebook page memorializing these observations. This page shows that dl753 produced larger plaques than wild-type.
- Plaque development assays indicated that ADP mutant Ad produced plaques at different rates than wild type Ad (see pages A3-A17, which are plaque assay results which show that dl753 and dl732 produce plaques faster than wild type Ad, and ADP deletion mutants form plaques slower than wild-type). Note that "rec700" represents wild-type Ad, and "dl 753" and "dl 732" are adenoviruses that have deletions in the E3 region [not in the open reading frame for ADP] that result in increased synthesis of ADP; and dl712, dl801, dl742, dl708 and dl7001 have deletions in the coding region for ADP that preclude synthesis of functional ADP.
- Gel electrophoresis studies were carried out which indicated that E3 deletion Ad produced higher levels of ADP (see Exhibit A, pages A18-A20, which are photocopies of those gels that show that dl753 (an E3 deletion mutant) produces more ADP than rec700 (which produces wild-type levels of ADP)).
- Immunofluorescence assays were carried out that confirmed these findings that E3 deletion mutants produce more ADP than wild-type (See Exhibit A, pages A21-A25, where dl732 and dl753 are E3 deletion mutants that overexpress ADP, dl712 is an E3 mutant in which the gene for ADP is deleted, and rec700 is wild-type).



- In virus release assays, we observed that the ADP mutants that had large plaques released more virus than both wild-type Ad and ADP mutants that had small plaques (A26).

- This early work led us to hypothesize that ADP is required for cell lysis, and release of Ad. We also hypothesized that over-expression of ADP may cause cell lysis more rapidly, and therefore, that vectors that overexpress ADP may be useful as anti-cancer agents.

- A proposal, entitled "Adenovirus E3-11.6K Protein as a Cell Death-Promoting Agent," was sent to Dr. Rae Lyn Burke of Chiron Corp. That Proposal is submitted herewith as Exhibit B. At page 7 of that proposal, the concept of overexpressing ADP (11.6K) is discussed. Further, at page 4 the KD/GZ class of adenovirus vectors are described, where it is stated that "[t]he nondefective vectors generally have the E3 transcription unit deleted and replaced with the transgene" [e.g., ADP]. The concept that deletion of the E3 transcription unit and insertion of the ADP gene would result in overexpression is based on the understanding that deletion of most or all of the E3 genes other than the ADP gene facilitates overexpression of ADP mRNA by reducing competition for splicing of the major late pre-mRNAs. That concept is put forth in the instant specification at page 15, lines 12-17. That concept is also discussed in the proposal at page 7, where it is stated that "...we will determine whether 11.6K overexpressed during early stages of infection can promote cell death. The 11.6K gene will be built into our mutant, dl7001, which lacks the entire E3 region but expresses all other adenovirus genes... Cells will be infected with the dl7001-11.6K vector...and cell death will be monitored."

6. Prior to March 3, 1997, we constructed a recombinant adenovirus vector that is replication-competent in neoplastic cells and that overexpresses ADP. Specifically, KD1 is a recombinant adenovirus vector that is replication-competent in neoplastic cells and that overexpresses ADP. KD1 was constructed by cotransfecting dl1101/1107 DNA that had been digested with EcoRI and plasmid p54 DNA comprising the ADP gene into 293 cells. DNA from resulting plaques was confirmed as KD1 by PCR. The following activities, which occurred prior to March 3, 1997 are related to the construction and evaluation of ADP overexpressing vectors generally, and specifically KD1:

- High titer dl1101/1107 stocks were expanded for the purpose of examining whether this virus with a mutation in the E1A gene would grow well on cancer cell lines and not on non-cancerous cell lines, and also for the purpose of deleting the E3 region of an Ad strain and inserting the ADP from Ad5. (See Exhibit D1) (dl1101/1107 serves as the "backbone" of the KD strains described in the 09/351,778 application, see page 22, Table 1).

- High titer dl1101/1107 stocks were confirmed. (D2-D3).
- The EcoRI-A fragment of Ad5 containing the DNA sequence encoding ADP was purified. (D4)
  - Various deletions and insertions were made in the backbone adenoviral E3 region by PCR. For example, in the construction of KD1, the ADP gene was isolated from the Ad5 genome by PCR using the primers named KD6 and KD7 that added PacI restriction sites to the DNA fragment containing the ADP gene. (E3, E4 and E9). This ADP-containing PCR fragment was cloned into a PacI site in the plasmid named pL2 to produce the shuttle plasmid named p54 (F7-F8) (D9). Another name for plasmid pL2 is pLKHE2A + Bam → end + Cla. The sequences for primers KD6 and KD7 are presented in Appendix E1, E3, E4 and E9 and are described in the examples in the '778 application. These primers as well as other primers were purchased from Gibco BRL. Exhibit E comprises order sheets and certificates of analysis for a number of those primers, along with contemporaneous notes that describe the primers. (E1-E10)
- Growth curves to assess whether dl1101/1107 is attenuated for growth as compared to dl309 in HEL299 cells. (I1-I31)
- Various plasmids used to construct the KD vectors were sequenced. (F1-F8)
- The DNA sequence of the ADP gene inserted into plasmid p54 was determined using the KD6 and KD7 primers (F7-F8)
- The ADP gene was successfully subcloned into the shuttle plasmid vector, culminating in the isolation of the KD1 shuttle plasmid vector. (Exhibit F5-F6) (D9)
- dl1101/1107 DNA that had been digested with EcoRI was cotransfected into 293 cells together with plasmid p54 DNA. (D39)
- Seven putative KD1 plaques from the above transfection experiment were observed. (C1) (KD) (WW) DNA from these plaques is confirmed as KD1. (C6)
- New DNA was prepared from cells infected separately with viruses isolated from ten plaques that resulted from the above co-transfection experiment. (C6)
- The above DNA was analyzed by restriction enzyme digestion and PCR. Three of the plaques were shown to contain the E3 region from plasmid p54; that is, three of the plaque isolates were KD1. (C9) (D48-49)
- A second cotransfection experiment was performed using EcoRI-digested dl1101/1107 DNA plus plasmid p54 in a repeat attempt to construct KD1. (D47). On 3/6/97 the Hirt supernatant DNA from four plaque isolates had been analyzed by PCR;

three of the plaque isolated had the E3 region of KD1. (D52) (C16). Thus, prior to March 3, 1997, KD1 had been constructed in two separate experiments.

7. From the time the KD1 vector was made, we continued to work on construction and characterization of additional replication competent vectors that overexpress ADP, as evidenced by the activities listed below. This work eventually led to the KD3, GZ1 and GZ3 vectors described in the specification of the '778 patent, particularly in the Examples. Our experiments show that KD1 overexpresses ADP. Specifically, on or about May 20, 1997, we show that KD1 develops plaques faster than dl309, which expresses wild-type levels of ADP. Faster plaque development is correlated with overexpression of ADP. Based on the plaque development assay, we concluded that KD1 overexpresses ADP. In addition to the activities listed below, certain activities occurred on a continual basis. Those activities include, among others, maintenance of stocks of human cell lines used in evaluating the vectors; maintenance of bacterial cell cultures used to generate stocks of the various plasmids used to construct the claimed vectors; experiments such as virus growth curves, virus plaque assays, virus spread assays, virus induced cell death assays, all of which require multiple days to complete; lab meetings and informal discussions of progress and strategies for future experiments. The following activities are evidence of our continuous efforts:

**3/3/97-3/7/97:**

- From prior to March 3, 1997 through at least March 7, 1997, plaque assays of KD1 (also referred to as 544 in the attached exhibits) continued to progress and observations were made. Also, stocks of cells comprising the recombinant virus with the E3 region deleted and ADP inserted were maintained. (C15-16)
- On 3/6/97 the Hirt supernatant DNA from four plaque isolates from the second cotransfection experiment performed using EcoRI-digested dl1101/1107 DNA plus plasmid p54 had been analyzed by PCR; three of the plaque isolated had the E3 region of KD1. (D52) (C16).
- Growth curves with dl1101/1107 and dl309 on HEL299 cells or WI38 cells continue. (I32)

**3/7/97-3/14/97:**

- Plaque assays of the KD1 vector continued. (C19)
- Virus growth assays continued on WI38 cells to assess the growth of dl1101/1107. (C20)
- Assays continue to assess dl1101/1107 and dl309 in growth arrested vs. growing HEL299 cells. (C21, I33-34)
- Initial stocks of the KD1 virus had been prepared. (C19)

**3/14/97-3/21/97:**

- The E4 promoter region of dl1101/1107 was sequenced to help in constructing an E4 promoter substituted virus. (C22)
- Virus growth assays continued on WI38 cells to assess the growth of dl1101/1107. (C23)
- Sequencing of plasmids used to construct the KD vectors continued using various primers. (F9-F12)
- Assays continued to assess dl1101/1107 and dl309 in growth arrested vs. growing HEL299 cells. (C24-25)

**3/21/97-4/4/97:**

- HEL299 growing and growth arrested cells are infected with dl1101/1107 and dl309 and virus growth assays are in progress. (C26, I35-36)
- dl1101/1107 extracted from WI38 permissive cells is titered. (C27)

**3/21/97-4/11/97:**

- dl1101/1107/EcoRI and p101 or p111 are cotransfected and cell cultures observed to identify plaques that may comprise the KD2 and KD3 vectors. (C28)

**4/4/97-4/11/97:**

- Growth assays with dl1101/1107 and dl309 continue in HEL299 cells. (C29)
- Titer experiments continue with dl1101/1107 extracted from WI38 cells. (C30)

**4/11/97-4/18/97:**

- Plaques with putative KD2 and KD3 virus are observed, and Hirt preps of DNA from those plaques are made. (C31)

- Titer experiments continue with dl1101/1107 extracted from WI38 cells, and preliminary data are collected. (C32)

- Growth curve experiments with dl1101/1107 and dl309 on growth arrested and growing HEL299 cells are continued and data are compiled. (C34-35)

4/18/97-4/25/97:

- PCR and restriction enzyme digestions are done to confirm KD2, and Hirt DNA preps are made for putative KD3 plaques. (C36)

- Titer experiments continued with dl309 and dl1101/1107 extracted from infected WI38 cells. (C37-39)

- Growth curve experiment was started with dl1101/1107 and dl309 viruses on MCF-7 human breast cancer cells. (C37)

- HEL299 cells infected with dl1101/1107 and dl309 are frozen for growth curve analysis. (C40)

- Sequencing of plasmids used to construct KD vectors continued using various primers. (F13-F17)

- Cell culture supernatant stock of KD virus is given to lab technician (SB) for preparation of a high titer CsCl-banded stock. (C36)

4/18/97-5/2/97:

- Titrations of virus extracted from HEL299 cells infected with dl1101/1107 and dl309 continues. (C45)

- Plaque development assay started with KD1 comparing it to dl309 (wild-type E1A, normal ADP expression), dl1101/1107 (E1A mutation, wild-type ADP expression), pm734.1 (wild-type E1A, no ADP expression), and dl7001 (wild-type E1A, no ADP gene). The cell lines used were 293 and A549 cells. (C41) (D90-D92). The results of this plaque assay are shown graphically at C56. The KD1 and dl309 plaques developed approximately 2 to 3 days faster than did the plaques of dl1101/1107. The fact that KD1 plaques developed more rapidly than those of dl1101/1107 indicates that KD1 overexpresses ADP.

- SB (lab technician) obtained the KD1 virus from KD and began experiments to expand the amount of virus. (K21)

**4/25/97-5/2/97:**

- KD3 vector (referred to as dlE3Xba + ADP) was confirmed by PCR and restriction enzyme digestion. (C41)
- Experiments to expand KD1 continue. (K22 K23)

**5/2/97-5/9/97:**

- Stocks of dlE3 + ADP were grown and monitored for plaque development. Also, cells transfected with KD1, KD2 and KD3 are monitored for development of plaques relative to dl309. (C47, C49)
- Growing and growth arrested dl1101/1107 infected HEL299 cell extracts are titred for growth curve. (C50)
- Expansion of KD1 continues. (K24) (C49)

**5/9/97-5/23/97:**

- Plaque development assays continue, to asses KD1, KD2 and KD3 relative to wild-type. (C51)
- Plaque assays to assess expression of ADP by KD1 relative to several viruses with wild-type E1A genes continue. Fast plaque formation by KD1 indicates ADP overexpression. (H2-H3)
- Growth curves with dl309 and dl1101/1107 extracted from HEL299 cells continue, and data is collected at various intervals. (C52-53)
- Sequencing of primers used to construct KD vectors continued. (F18-F19)
- Titering of dl309 DNA extracted from 293 cells is initiated. (I37)
- Growth curves with dl309 and dl1101/1107 extracted from HEL299 cells continue. (I38)
- Expansion of KD1 continues. (K25) (AT)

**5/13/97-6/2/97:**

- Plaque assay to assess KD1. Results indicate that KD1 overexpresses ADP. (K25-K28)

- Expansion of KD1 continues. (K26)

**5/20/97-6/8/97:**

- Plaque assays of various viruses including KD1 and dl751. (H4-H10). The plaque development curve indicates that KD1 formed plaques as well as or better than dl751, a virus that overexpresses ADP. This suggests that the virus had good ADP expression and function. (K27-28) (H4-H9). KD1 was plaque assayed along with dl751 (which expresses higher than normal quantities of ADP), two preparations of dl707 (a mutant in which a portion of ADP is deleted and which therefore would be expected to have delayed kinetics of plaque formation), and pm734.9 (an ADP mutant with a three amino acid mutation at the C-terminus of ADP [listed as PME on the plaque assay counts]).

**5/23/97-5/30/97:**

- Plaque development assays were monitored and results collected. C56 is a graphical presentation of results indicating that KD1 develops plaques as quickly as dl309 and quicker than dl1101/1107, and that KD2 and KD3 develop plaques more quickly than dl1101/1107. (C55-C58)

**5/30/97-6/27/97:**

- Efforts focused on further characterization of the KD vectors, and improvements on those vectors, such as for example substituting the E4 promoter. Growth curves with dl1101/1107 continued, and Plaque development assays with KD1 indicated that KD1 develops plaques somewhat slower than dl309. (C65-C82)

- Infections were done for immunofluorescence staining for ADP. Viruses used for infection were dl309, KD1, KD2 and KD3. It is noted that KD shows much more staining for ADP than the other viruses (both at 27 and 49 hours post-infection). This is supporting data for the overexpression of ADP by the KD viruses. (H1-H2)

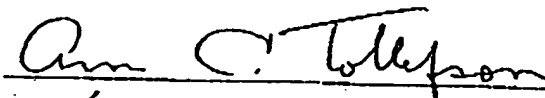
8. As evidenced by the foregoing, we confirmed that KD1 overexpresses ADP by Immunofluorescence assays utilizing an ADP-specific antibody on or about June 23, 1997.

9. We confirmed that KD1 overexpresses ADP by Western blot on or about December 1, 1997. (Exhibit L, pages L2-L4)

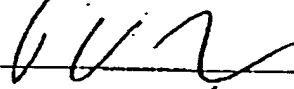
10. I understand that willful false statements and the like are punishable by fine or imprisonment, or both (18 U.S.C. 1001) and may jeopardize the validity of the application or any patent issuing thereon.



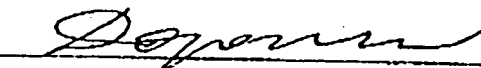
William S.M. Wold, Ph.D.



Ann E. Tollefson, Ph.D.



Karoly Toth, Ph.D. DVM KI



Konstantin Doronin, Ph.D.



Al

FROM

UNIVERSITY MMI

FAX NO. : 3147733403

Dec. 19 2002 10:21AM P2

Final Counts

871972 plaque assays

(Cumulative)

DME

55 0

56 0

57 (all cells dead)

1 106

19 88

37 120

2 83

20 108

38 114

3 84

21 95

39 123

4 13

22 14

40 16

5 12

23 14

41 12

6 5

24 12

42 12

7 omit → cells dead

25 78

43 1

8 69

26 74

44 1

9 68

27 71

45 1

10 11

28 14

46 0

11 9

29 8

47 1

12 9

30 10

48 0

13 110

31 41

49 46

14 107

32 37

50 57

15 85 (but high cell death)

33 41

51 52

16 16

34 5

52 (total cell death)

17 7

35 1

53 6

18 9

36 6

54 8

Ad5 → distinct plqs  
1035 → not as definitive  
1038 →

1041 → more distinct plq  
918 → distinct  
305 → distinct

large plaques  
716 → largest, most distinct plaques

Small plaques  
801 → very small + slow growth  
712 → very small with slow growth

A2

11.6K → possibly related to plaque size  
+ morphology?  
(tend to vary more  
in plaque size)

Plaque SizeLarger & distinct

dl 753 (exp.)

dl 754

dl 714

dl 778

Ad 5 (exp.)

dl 799

~~dl 778~~

dl 716 (exp.)

dl 751 (exp.)

dl 718

Smaller / less distinct

most SPY 10.4K mutant

[dl 775 more distinct + larger]

pm 771

dl 713

dl 327 (smaller than  
rec 700 in dl 728)Small

748

712

dl 801

dl 766

dl 742

pm 785

In 724

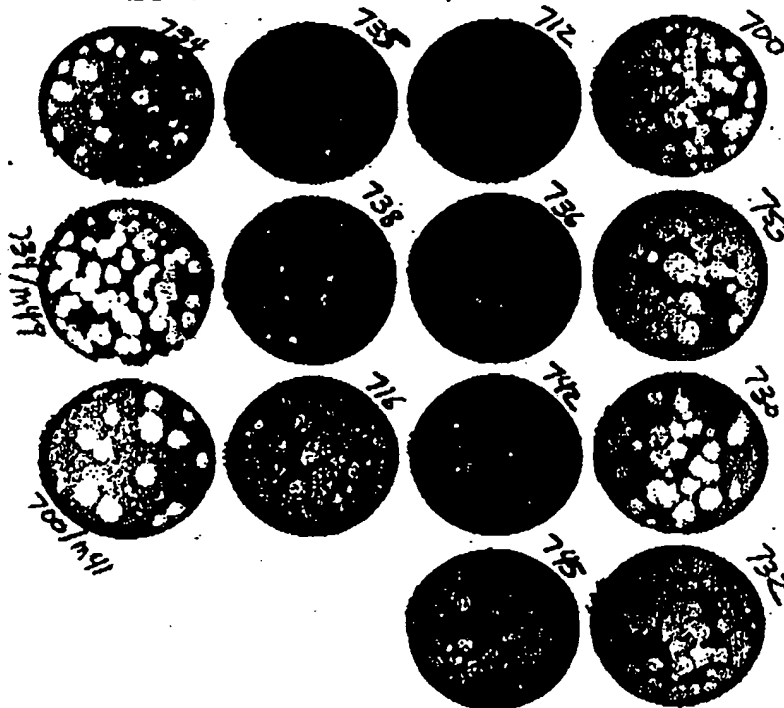
dl 748

dl 706

dl 708

dl 717

dl 7001

**E3-11.6k Small Plaque Mutants**

Early work  
on defining  
ADP function

EXHIBIT

A3

## EXHIBIT

A4

## Plaque Assays

(11.6K mutants <sup>to test</sup> ~~plaque assay~~)

Ultram	Prep	Titer	5*10 <sup>-9</sup>	5*10 <sup>-10</sup>
① rec 700 (VS188)(910513)		2.37*10 <sup>11</sup>	2	3
② dl 742 (860313)		1.77*10 <sup>11</sup>	2	3
③ dl 745 (860313)		2.06*10 <sup>11</sup>	2	3
④ dl 716 (ply 1)(VS204)(911101)		1.56*10 <sup>11</sup>	2	3
⑤ dl 730 (39-4)(VS168)(901214)		1.73*10 <sup>11</sup>	2	3
⑥ dl 732 (29/1)(AS)(890414)		3.4*10 <sup>11</sup>	2	3
⑦ pm 734 (17/2)(890504)		6.7*10 <sup>10</sup>	3	2
⑧ dl 735 (34/1)(890425)		9.*10 <sup>10</sup>	3	2
⑨ dl 736 (0.01/1)(890414)		2.88*10 <sup>10</sup>	3	2
⑩ dl 738 (38-11)(VS171)(910113)		?	3	3
⑪ 700/m41 (AS)(920214)		?	3	3
⑫ pm 734/m41 (AS)(920402)		?	3	3
⑬ dl 716 (ply. 4)(VS125)(900202)		2.04*10 <sup>11</sup>	1	2
⑭ dl 753 (VS78)(880624)		1.42*10 <sup>11</sup>	1	2
⑮ mock		-	(150)	

SF-DME for all pre-infection;  
infection with 0.5 ml of dilutions at 4:30 pm;  
added 6 ml of overlay at 5:45 pm;

(5/29) added 5 ml of NR overlay; one dish of  
dl 738 (5\*10<sup>-7</sup> dilution) dropped → discarded

on (5/29) see large distinct plaques on dl 730, dl 732,  
dl 716, dl 753 dishes (+ some dl 715), rec 700 may  
have a few smaller plaques & overlay do not  
see plaques on other dishes yet.

EXHIBIT

AS

(1/2) plaques were red in well  
(6/3) marked in green

## Counts of (5/25) Plaque Assays

Sample	Dilution	A	B	C	Comments
① rec 700 (V5188)(910503)	$.5 \times 10^{-9}$ $.5 \times 10^{-10}$	+39 55 +8 2	+35 51 +4 2	- +4 3	quite large + distinct vary in size. 6 how distinct smaller & less distinct (than 730, 732, 733)
② dl 742 (860313)	$.5 \times 10^{-9}$ $.5 \times 10^{-10}$	+23 0 0	+52 +1 0	- 0 0	very indistinct empty to indistinct
③ dl 745 (860313)	$.5 \times 10^{-9}$ $.5 \times 10^{-10}$	+20 24 +2 5	+13 22 +1 1	- +2 3	quite large to <sup>or</sup> slightly quite distinct larger Similar size to rec 700
④ dl 712 (plg 1) (V5204)(711100)	$.5 \times 10^{-9}$ $.5 \times 10^{-10}$	+8 0 +1 0	+6 0 0 0	- 0 0	no plgs. visible. (at least not definitive) very small plaques
⑤ dl 730 (37-4) (V5168)(701214)	$.5 \times 10^{-9}$ $.5 \times 10^{-10}$	+16 20 +1 1	+22 20 +4 3	- +1 7	quite large to distinct probably larger than rec 700
⑥ dl 732 (29/1) (AS)(890414)	$.5 \times 10^{-9}$ $.5 \times 10^{-10}$	+8 72 +3 4	+12 52 +3 1	- +3 5	larger + more distinct than dl 730 + dl 733 large + very distinct
⑦ pm 734 (1 1/2) (890504)	$.5 \times 10^{-9}$ $.5 \times 10^{-10}$	+16 4 +4 0	+8 1 +2 0	+20 5 -	probably not very small, but very indistinct than rec 700
⑧ dl 735 (34/1) (890425)	$.5 \times 10^{-9}$ $.5 \times 10^{-10}$	+8 6 0 0	+1 0 +1 0	(+13) +1 3 -	indistinct plaques, size not very definite very small + indistinct
⑨ dl 736 (0.01/1) (890414)	$.5 \times 10^{-9}$ $.5 \times 10^{-10}$	+1 1 0 0	+2 1 0 0	+4 1 -	indistinct plaques very small + indistinct

EXHIBIT

A6

(7/31) plaques

(6/3) marked in green

## Counts of (1/25) Plaque Assays

Sample	Dilution	A	B	C	Comments
(10) dl738(38-11) (V5171)(710118)	$.5 \times 10^{-9}$ $.5 \times 10^{-10}$	+6 4 0 0	+1 11 0 0	— 0 0	not too small, but not very distinct small & indistinct
(11) 700/m41 (ASX920214)	$.5 \times 10^{-9}$ $.5 \times 10^{-10}$	+7 8 +0 2	+13 11 +2 0	+12 10 +1 2	~ like rec 700 quite large & very distinct
(12) pm 734/m47 (AS) (920402)	$.5 \times 10^{-9}$ $.5 \times 10^{-10}$	+35 28 +11 3	+13 31 +6 4	+46 36 +7 1	~ like rec 700 ~ like rec 700
(13) dl 716 (plg4) (V5125)(700202)	$.5 \times 10^{-9}$ $.5 \times 10^{-10}$	+26 62 +1 5	— +1 3	— —	quite large & distinct larger & more distinct than rec 700
(14) dl 753 (V578)(880624)	$.5 \times 10^{-9}$ $.5 \times 10^{-10}$	+15 42 +2 2	— +0 3	— —	quite large & distinct very large & distinct
(15) mock	—	0 0	—	—	good monolayer

## EXHIBIT

A7

Sample		Counts of (7/25) Plaque Assays				Comments
		Dilution	A	B	C	
① rec 700 (V5188)(910503)		$.5 \times 10^{-9}$	+13	+16	—	plaques quite larger distinct, new plaques distinct
		$.5 \times 10^{-10}$	+0	+3	+1	
② dl 742 (860313)		$.5 \times 10^{-9}$	+6	+5	—	new plaques very indistinct, older plaques still small with diffuse edges
		$.5 \times 10^{-10}$	0	+1	0	
③ dl 745 (860313)		$.5 \times 10^{-9}$	+7	+7	—	large, distinct plaques; new plaques very distinct
		$.5 \times 10^{-10}$	+2	+0	+1	
④ dl 712 (pl 1) (V5204)(911101)		$.5 \times 10^{-9}$	+6	+10	—	small & indistinct older plqs still small
		$.5 \times 10^{-10}$	+0	0	0	
⑤ dl 730 (39-1) (V5168)(901214)		$.5 \times 10^{-9}$	+6	+8	—	very large & very distinct plaque new plqs distinct
		$.5 \times 10^{-10}$	+1	+1	+2	
⑥ dl 732 (29/1) (A5)(890414)		$.5 \times 10^{-9}$	+4	+2	—	very large & distinct plaque
		$.5 \times 10^{-10}$	+0	+4	+1	
⑦ pm 734 (19/2) (890504)		$.5 \times 10^{-9}$	+19	+17	+13	plaques a bit smaller than rec 700; new plaque quite distinct
		$.5 \times 10^{-10}$	+2	+1	—	
⑧ dl 735 (34/1) (890425)		$.5 \times 10^{-9}$	+6	+12	+13	small & very indistinct plaq
		$.5 \times 10^{-10}$	+1	+1	—	
⑨ dl 736 (0.04/1) (890414)		$.5 \times 10^{-9}$	+5	+5	+6	very small & very indistinct (both old & new)
		$.5 \times 10^{-10}$	+1	0	—	

(4/5) n.a.r (c.o. n. m. p.)

## EXHIBIT

A8

## Counts of (5/25) plaque Assays.

Sample	Dilution	A	B	C	Comments
(10) dl 738 (38-11) (V5171)(910118)	$.5 \times 10^{-9}$ $.5 \times 10^{-10}$	+5 +1	+6 0	— 0	new plaques very small & indistinct, even older plaques are ~ 0 size with diffuse edges
(11) 700/m41 (AS)(920214)	$.5 \times 10^{-9}$ $.5 \times 10^{-10}$	+5 +0	+2 +0	+5 +0	plaques large, new plaques very distinct (similar size to much older 738)
(12) pm 734/m49(AS) (920402)	$.5 \times 10^{-9}$ $.5 \times 10^{-10}$	+17 +4	+16 +1	+17 +5	new plaques very distinct, fairly large & distinct, maybe a bit smaller than rec 700 plaques
(13) dl 716 (plg 4) (V5125)(900202)	$.5 \times 10^{-9}$ $.5 \times 10^{-10}$	+1 +1	— +1	— —	very large & distinct (exp. on $10^{-10}$ )
(14) dl 753 (V578)(880624)	$.5 \times 10^{-9}$ $.5 \times 10^{-10}$	+7 +1	— +2	— —	very large & distinct
(15) mock	—	0	—	—	good monolayer



EXHIBIT

A9

## Counts of (5/25) Plaque Assays

Sample	Dilution	A	B	C	Comments
① rec 700 (V5178)(910503)	$.5 \times 10^{-9}$ $.5 \times 10^{-10}$	+3 +1	+6 +1	- +1	distinct fairly large plaques
② dl 742 (860313)	$.5 \times 10^{-9}$ $.5 \times 10^{-10}$	+20 +3	+22 +2	- +1	small & indistin: plaques; new plaques "pinpoint"
③ dl 745 (860313)	$.5 \times 10^{-9}$ $.5 \times 10^{-10}$	+7 +0	+2 +0	- +1	large distinct plaques
④ dl 712 (ply 1) (V5204)(911101)	$.5 \times 10^{-9}$ $.5 \times 10^{-10}$	+28 +1	+29 +1	- +2	very small plga; new plga "pinpoint"
⑤ dl 730 (39-4) (V5168)(901214)	$.5 \times 10^{-9}$ $.5 \times 10^{-10}$	+1 +1 (mild)	+4 +0	- +0	very large, nice plaques (old plga - bit diffuse)
⑥ dl 732 (23/1) (A5)(890414)	$.5 \times 10^{-9}$ $.5 \times 10^{-10}$	+7 +0	+1 +0 (mild)	- +1	very large, nice plaques
⑦ pm 734 (1 1/2) (890504)	$.5 \times 10^{-9}$ $.5 \times 10^{-10}$	+28 +2	+28 +3	+25 -	slightly small plaques; new plaques fairly distinct
⑧ dl 735 (3 1/1) (890425)	$.5 \times 10^{-9}$ $.5 \times 10^{-10}$	+18 +5	+34 +7	+30 -	older plga times new plga ~ "pinpoints"
⑨ dl 736 (0.04/1) (890414)	$.5 \times 10^{-9}$ $.5 \times 10^{-10}$	+11 +0	+22 +0	+15 -	very small plga new plga "pinpoints"

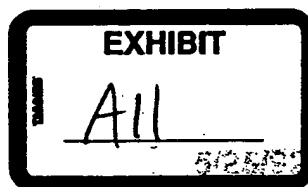
EXHIBIT

A10

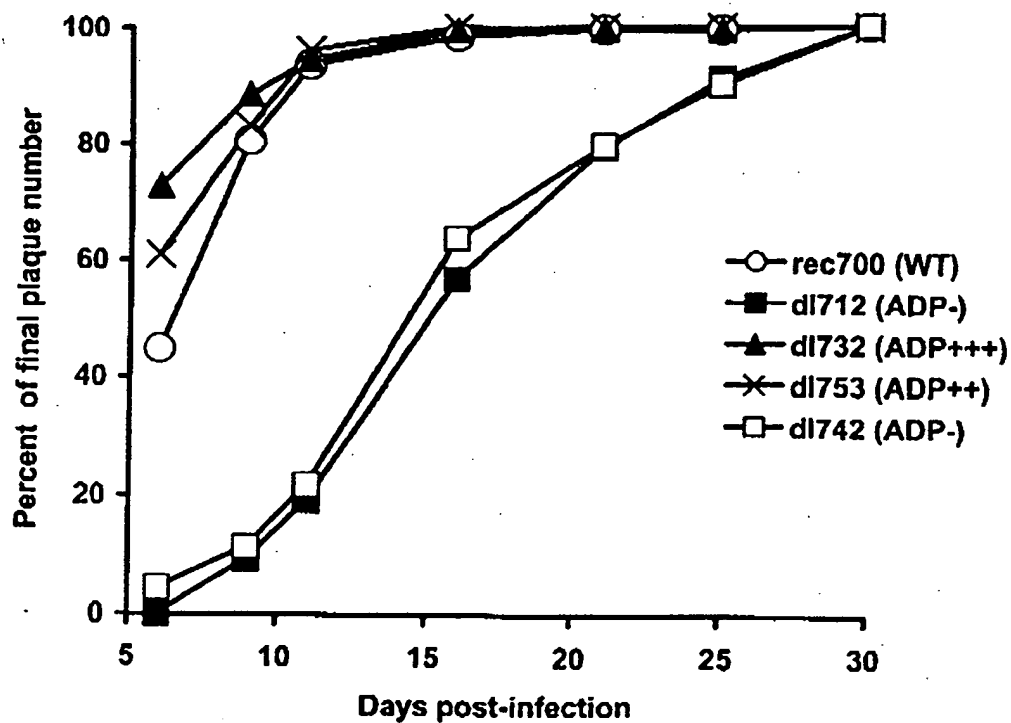
(180) marked in black

Counts of (5/25) plaque Assays

Sample	Dilution	A	B	C	Comments
(10) dl 738 (38-11) (VS171)(910118)	$.5 \times 10^{-9}$ $.5 \times 10^{-10}$	+22 +2	+16 +3	- +3	small + indistinct, new plaques very small
(11) 700/m41 (AS)(920214)	$.5 \times 10^{-9}$ $.5 \times 10^{-10}$	+3 +1	+5 +0	+4 +0	new ples larger than oldest of dl 738; large plaques + distinct
(12) pm 734/m49(AS) (920402)	$.5 \times 10^{-9}$ $.5 \times 10^{-10}$	+5 +2	+7 +3	+15 +4	large distinct plaques (new ples larger than oldest (738))
(13) dl 716 (ply 4) (VS125)(900202)	$.5 \times 10^{-9}$ $.5 \times 10^{-10}$	+3 +1	- +1	- -	very large + distinct
(14) dl 753 (VS 78)(880624)	$.5 \times 10^{-9}$ $.5 \times 10^{-10}$	+1 +0	- +2	- -	very large + distinct
(15) mock	-	0	-	-	good monolayer

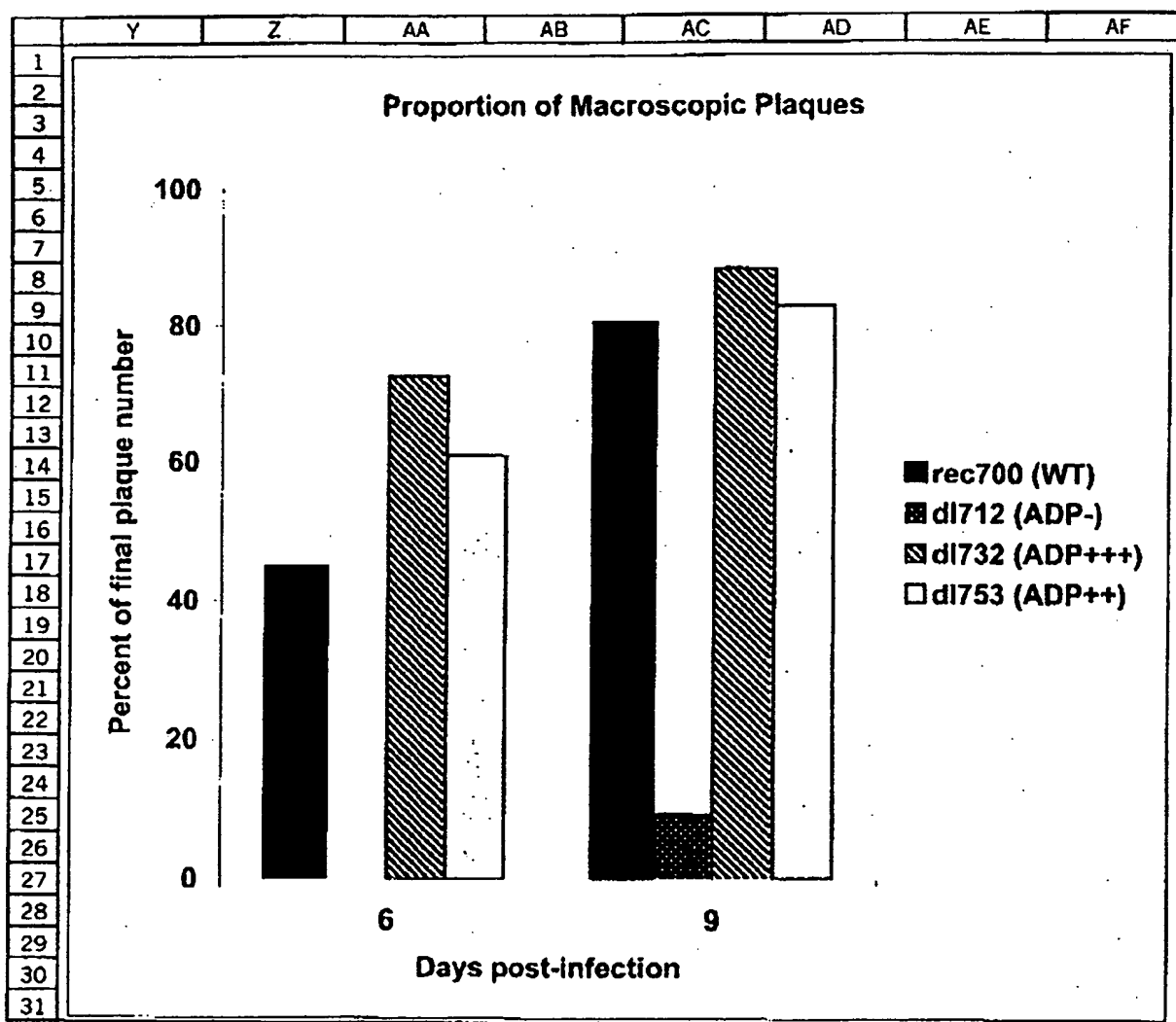


plaque assay



EXHIBIT

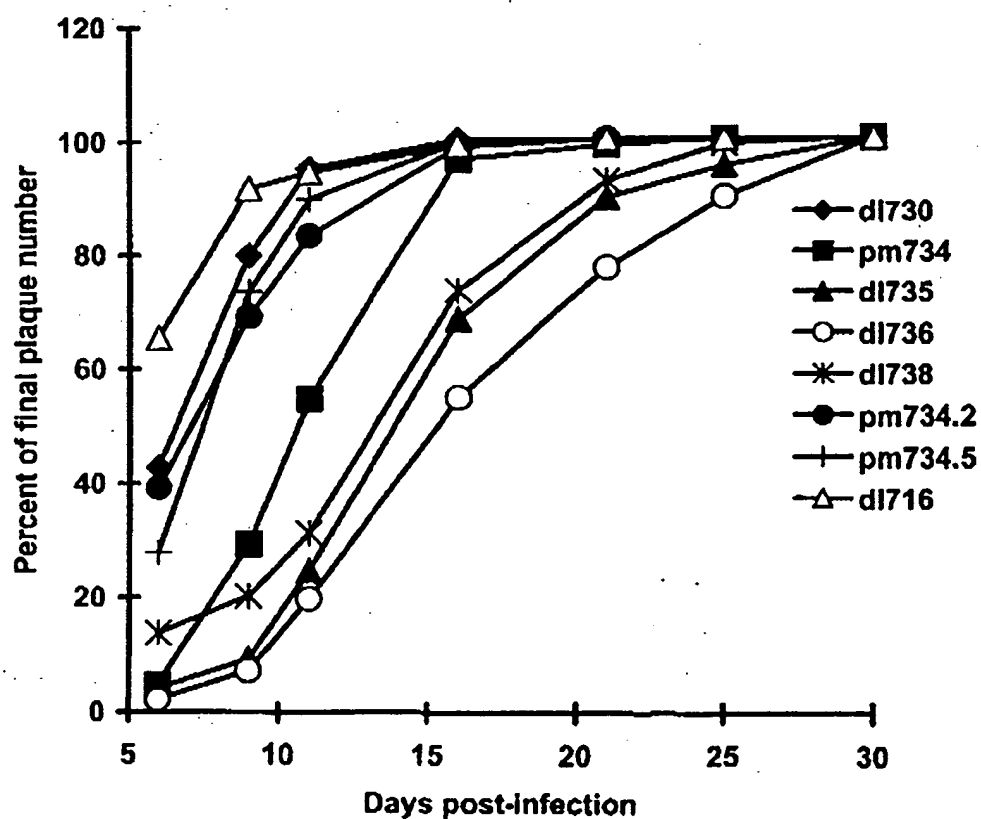
A12



**EXHIBIT**

A13

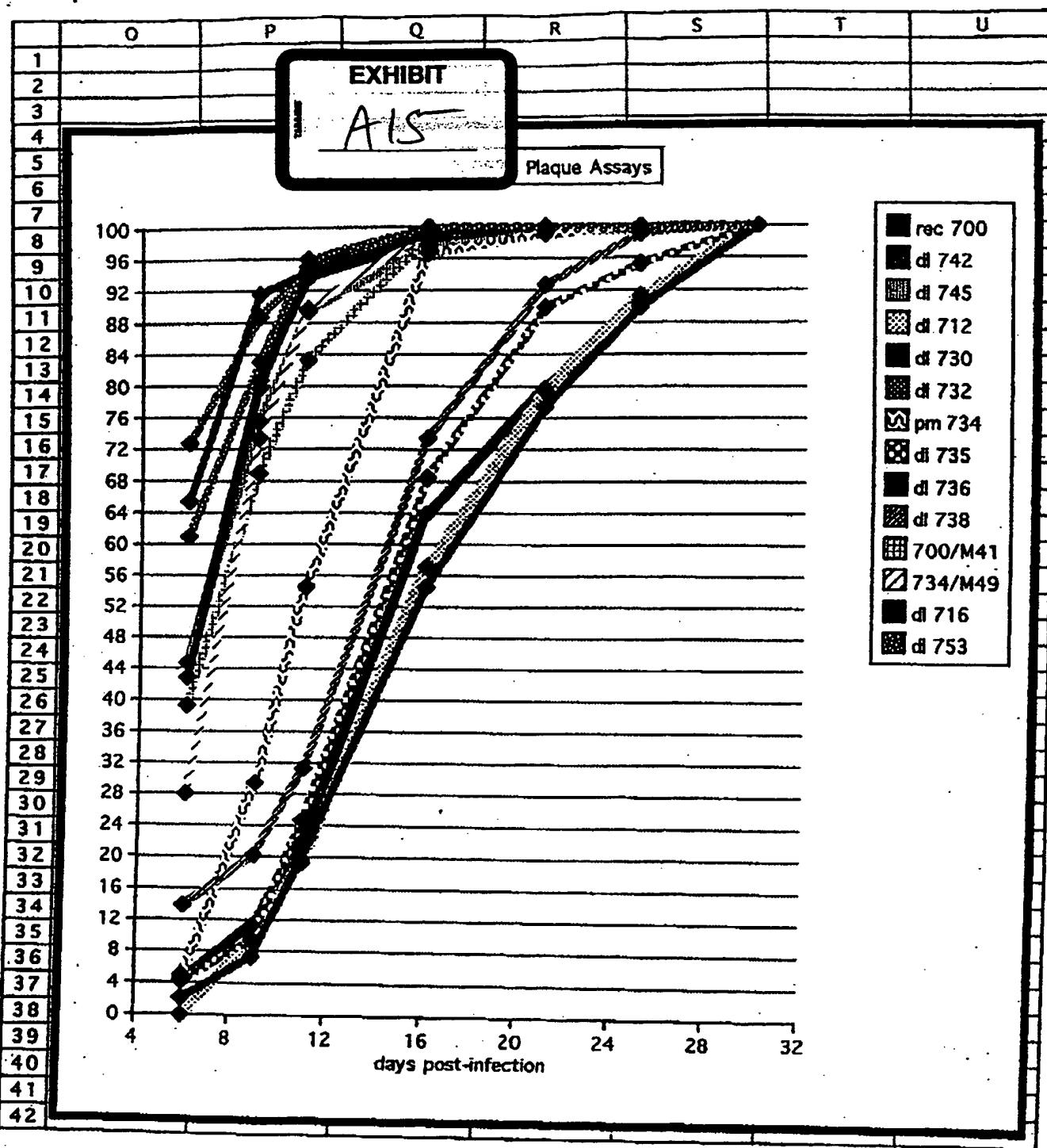
### 012502 plaque assay



## EXHIBIT

A14

	B	C	D	E	F	G	H
2	6	9	11	16	21	25	30
3	rec700 (WT)	44.8	80.6	93.7	98.4	99.6	100
4	dl712 (ADP-)	0	9.3	19.3	57.1	79.5	100
5	dl732 (ADP+++)	72.8	88.6	94.6	99.5	99.5	100
6	dl753 (ADP++)	61	83.1	96.1	100	100	100
7	dl742	4.4	11.4	21.9	64	79.8	100
8	dl745	44.7	75.6	89.4	97.6	99.2	100
9		6	9	11	16	21	30
10	dl730	42.9	79.8	95.1	100	100	100
11	pm734	4.9	29.3	54.6	96.6	99	100
12	dl735	4.2	9.3	24.7	68.4	89.8	100
13	dl736	2.2	7.3	19.7	54.7	77.4	100
14	dl738	13.8	20.2	31.2	73.4	92.7	100
15	pm734.2	39.3	69	83.3	98.8	100	100
16	pm734.5	27.9	73.4	89.7	99.5	100	100
17	dl716	65.4	91.6	94.4	99.1	100	100
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
31							



[illegible]





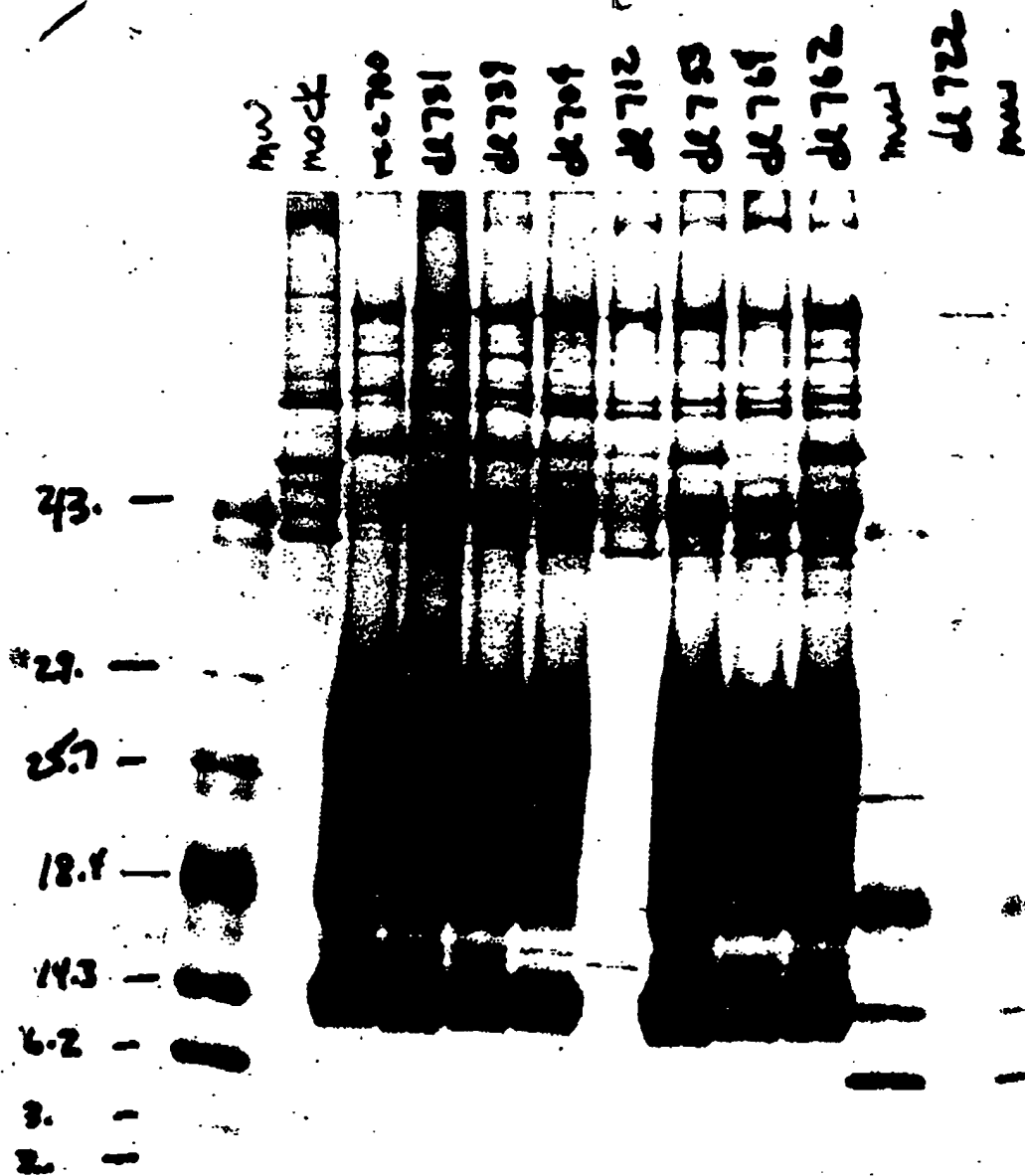


EXHIBIT  
A18

Gel #1

13 day exposure  
5 min developer

709 #1

11.6 (Deletion Mutation)

8/9 →

43. —

29. —

25. —

18.1 —

143 —

6.2 —

8. —

2. —

EXHIBIT

A19

Gal #1

13 day exposure

5 min developer

709 #1

11.6 (Petition Act)

8/9 →

EXHIBIT

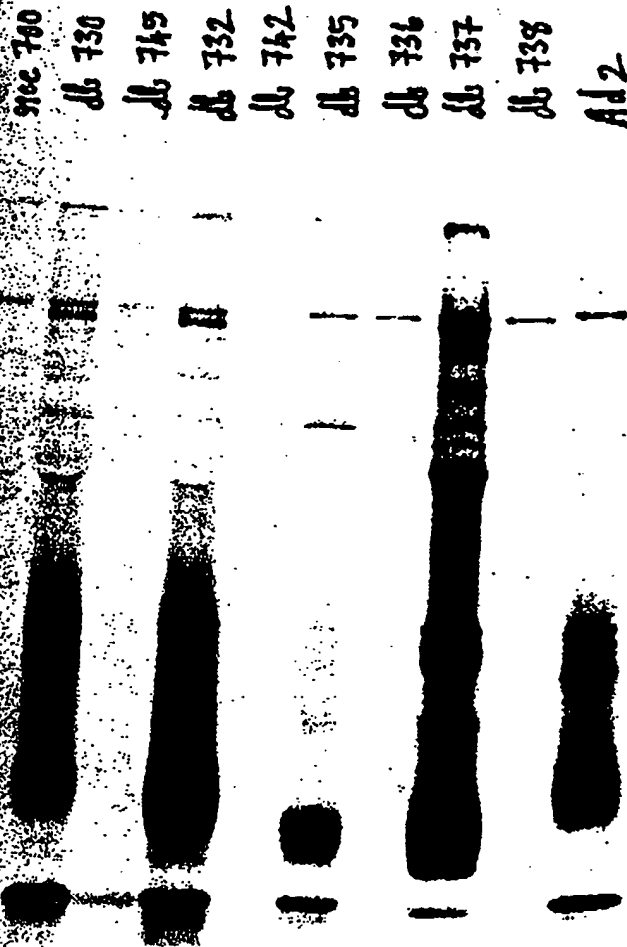
FROM : SAINT LOUIS UNIVER

:3147733403

Dec. 19 2002 10:39AM P4

A20

7 day exposure (5 min developer)





Stained by A.S.

set #1		set #2		set #3	
1	mock $\alpha 11.6(2-16)$	13	714 $\alpha 11.6(2-16)$	25	732 $\alpha 11.6(87-101)$
2	rec 700 $\alpha$ Fiber	14	715 $\alpha$ Fiber	26	742
3	dl 712	15	713	27	735
4	730	16	25-mer	28	737
5	745	17	734	29	738
6	732	18	734/ms6	30	35-mer
7	742	19	734/m49	31	714
8	735	20	mock $\alpha 11.6(87-101)$	32	715
9	736	21	rec 700	33	25-mer
10	737	22	dl 712	34	734
11	738	23	730	35	734/s6
12	35-mer	24	745	36	734/49

1st Ab's:

$\alpha 11.6(2-16)$  (910830 pseudo 2X; 1:4 dil)  
#98689 bleed out

800  $\mu$ l  $\left[ \begin{array}{l} (2-16) (1:200) \leftarrow 16 \mu\text{l} \\ \text{Fiber} (1:500) \leftarrow 1.6 \mu\text{l} \leftarrow \text{mt} \end{array} \right.$

$\alpha 11.6(87-101)$  (910830 pseudo 4X; 1:4 dil)  
#98686 bleed out

720  $\mu$ l  $\left[ (87-101) (1:400) \right] \frac{7.2 \mu\text{l}}{712.8}$

2nd Ab's:

(all 1:50 dil's)

$\left[ \alpha \text{Rabbit-FITC} / \alpha \text{mouse-RITC} \right]$

or  $\alpha \text{Rabbit-FITC}$

A22

slides)

920730

## Descriptions of AS 11.6K Mutants (TF)

① - ②  $\alpha$  11.6K (2-16) (1:200 dil) (1:400  $\alpha$  Fiber-RITC)

① L-mock - ~ no background for fiber; slight background for  $\alpha$  11.6K (esp. for mitotic spindle poles)  
 R-rec 700 - all in late stage (by Fiber staining); ~20-30% of cells stain for 11.6K (n.e. & Golgi primarily), some "debris" or aggregated material

② L-dl 712 - 100% inf'n; no 11.6K staining  
 R-dl 730 - 20-30% stain for 11.6K  $\rightarrow$  may be more Golgi & debris staining; 100% infected

③ L-dl 745 - ~100% inf'n; poss. very diffuse Golgi staining  $\rightarrow$  not very bright & see no n.e. staining  
 R-dl 732 - 70-80% stain for 11.6K  $\rightarrow$  n.e., Golgi (Golgi staining reduced); a lot of aggregated material

④ L-dl 742 - looks ~ like dl 712  
 R-dl 735 - 100% inf'n; very little 11.6K staining (poss a bit in Golgi, not really n.e.)

⑤ L-dl 736 - 100% inf'n; little if any staining, poss. some aggreg'd material but not definitive  
 R-dl 737 - 100% inf'n; bright staining; 30-40% of cells stained  $\rightarrow$  n.e., debris & virus replication sites

⑥ L-dl 738 - 100% inf'n; 11.6K aggregated material  
 R-35-mex - " " ; not so much n.e. staining & Golgi staining is very diffuse; more e.r.?

⑦ L-dl 714 - ~30% of cells stained, good n.e. & Golgi but also a lot of e.r. (do not see plasma membrane)

R-dl 715 - like 714 except less n.e. staining & more aggregated material

⑧ L-pm 734 - like 712

R-734/mSL - km. 00

" " " " " "

EXHIBIT

A23

## Descriptions (cont'd)

- ⑨ L-dl 713- 50-60% stained,  $\alpha$  n.c., Golgi + a lot of er-  
maybe more aggregated material  
R- 25-mer - less n.c. staining; seemingly more Golgi  
staining; seemingly less staining overall
- ⑩ L-pm 734/m49- like dl 712  
#11-20  $\alpha$  11.6K (87-101) (1:400 dil.)
- ⑪ L-mock- slight Golgi-like pattern (very light)  
R-rec 700- ~100% stained, good n.c., Golgi;  
more e.r. + particulate than sometimes
- ⑫ L-dl 712- a bit anti-nuclear (not 11.6K pattern)  
R-dl 730- ~100% of cells; very bright, maybe  
a bit more into all membranes (but n.c. + Golgi most)
- ⑬ L-dl 745- more "grainy" staining + more aggregated  
material, otherwise quite "normal"  
R-dl 732- almost 100% with very bright n.c.  
staining, also Golgi + some e.r. (brighter  
than rec 700)
- ⑭ L-dl 742- like 712  
R-dl 735- almost only Golgi (very reduced n.c.)
- ⑮ R-dl 737- very bright; typical pattern but more  
particulate + more e.r.
- ⑯ L-dl 738- not in membranes; some diffuse staining  
but mainly lots of aggregated material  
R- 35-mer - bright; in all membranes
- ⑰ L-dl 714- very bright; in all membranes  
R-dl 715- less n.c. and more in plasma membrane <sup>(than dl 714)</sup>
- ⑱ R- ~~25~~ 25-mer - more Golgi, less n.c., vesicles or particles in  
cytoplasm
- ⑲ L-pm 734- fairly typical but "grainier" appearance  
R- 734/ms6- sim to p 734 but not quite as bright
- ⑳ L- 734/m49  $\rightarrow$  sim to 734, maybe more Golgi +  
aggregat. m.t.

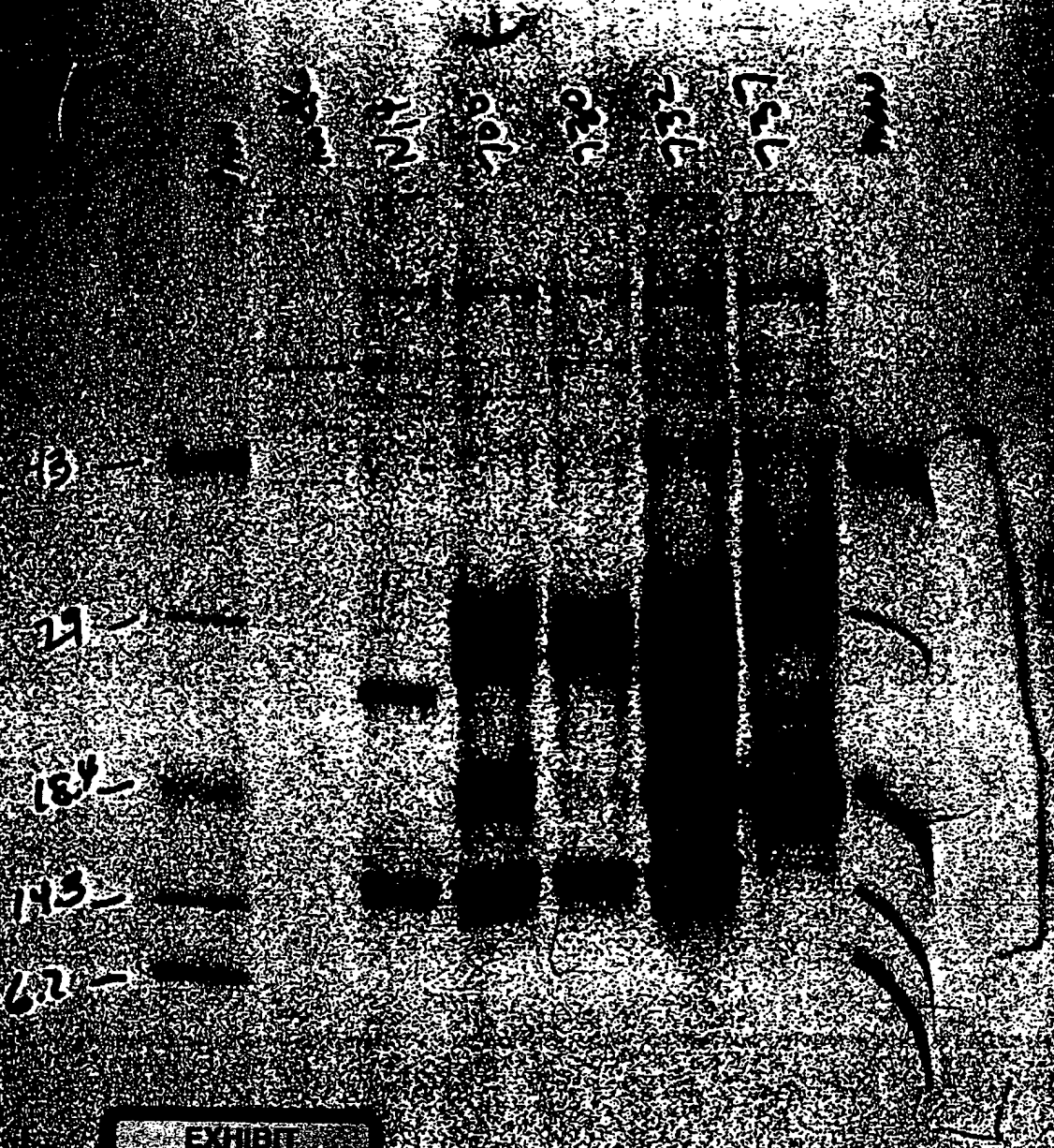
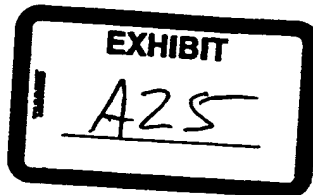


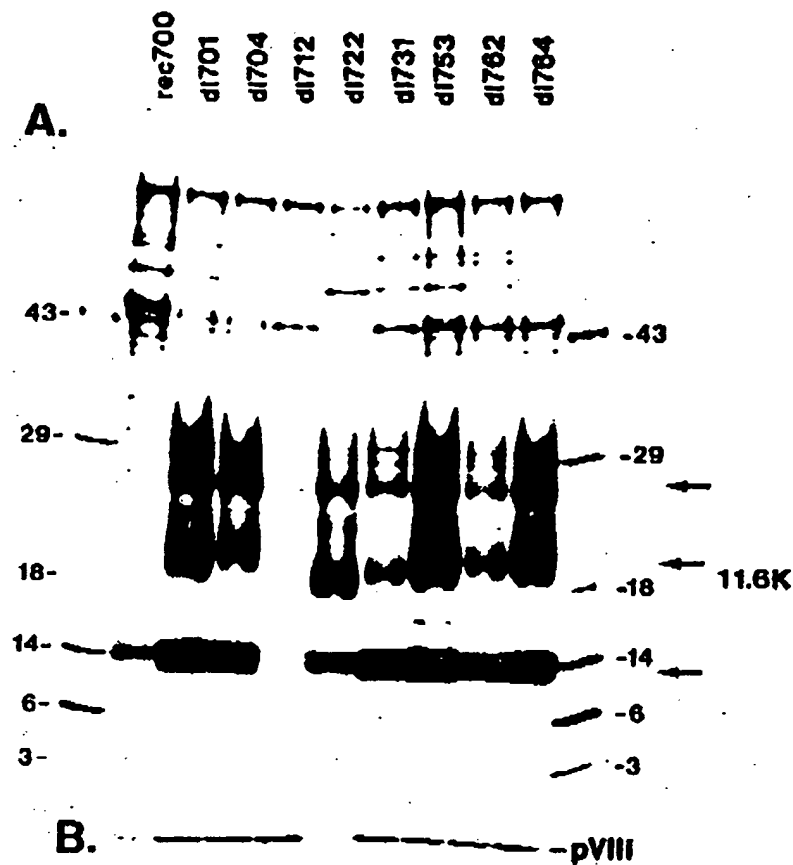
EXHIBIT  
A24

#1 100% 4 day exposure





#  
IF  
9108271.4?  
p/v w/?



Have all these  
prints.  
Fig. 1

900331 ccl #1  
~ 11.6K (87-101)  
like ext. vcl

(43) #1 ← (43) IF is pVIII  
... events

A26

(checking for 11.01.70)

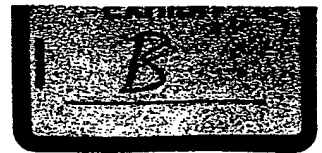
## Assays of Virus Release from A549 cells

Sample #	Infection	Sample Plated cells #	pfu	Time (p.i.)	PA det	PA dilution (all 5#)
①	mock	$2 \times 10^6$	—	7½h	—	—
②	mock	$5 \times 10^5$	—		—	—
③	rec 700	$2 \times 10^6$	$10^5$		(6/28) AT	$5 \times 10^0, 10^{-1}$
④	↓	$5 \times 10^5$	$10^5$			$10^0, 10^{-1}$
⑤	↓	$2 \times 10^6$	$10^3$			$10^0$
⑥	dl 712	$2 \times 10^6$	$10^5$			$10^0, 10^{-1}$
⑦	↓	$5 \times 10^5$	$10^5$			$10^0, 10^{-1}$
⑧	↓	$2 \times 10^6$	$10^3$			$10^0$
⑨	↓	$5 \times 10^5$	$10^3$			$10^0$
⑩	dl 753	$2 \times 10^6$	$10^5$			$10^0, 10^{-1}$
⑪	↓	$5 \times 10^5$	$10^5$			$10^0, 10^{-1}$
⑫	↓	$2 \times 10^6$	$10^3$			$10^0$
⑬	mock	$2 \times 10^6$	—	24h	(6/29) AT	$10^0$
⑭	mock	$5 \times 10^5$	—			$10^0$
⑮	rec 700	$2 \times 10^6$	$10^5$			$10^{-1}, 10^{-3}, 10^{-5}$
⑯	↓	$5 \times 10^5$	$10^5$			$10^{-1}, 10^{-3}, 10^{-5}$
⑰	↓	$2 \times 10^6$	$10^3$			$10^0, 10^{-2}, 10^{-4}$
⑱	dl 712	$2 \times 10^6$	$10^5$			$10^{-1}, 10^{-3}, 10^{-5}$
⑲	↓	$5 \times 10^5$	$10^5$			$10^{-1}, 10^{-3}, 10^{-5}$
⑳	↓	$2 \times 10^6$	$10^3$			$10^0, 10^{-2}, 10^{-4}$
㉑	↓	$5 \times 10^5$	$10^3$			$10^0, 10^{-2}, 10^{-4}$
㉒	dl 753	$2 \times 10^6$	$10^5$			$10^{-1}, 10^{-3}, 10^{-5}$
㉓	↓	$5 \times 10^5$	$10^5$			$10^{-1}, 10^{-3}, 10^{-5}$
㉔	↓	$2 \times 10^6$	$10^3$			$10^0, 10^{-2}, 10^{-4}$

at indicated times p.i., 1 ml of sup was removed, cells were pelleted (microfuge, 3 min) + sup removed to new Eppendorf; PA's of 0.5 ml volumes (single dishes); added back 1 ml of fresh DME (2% FCS) to each dish to replace volume removed



**SAINT LOUIS UNIVERSITY  
HEALTH SCIENCES CENTER**



**SCHOOL OF MEDICINE**

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**Department of Molecular  
Microbiology & Immunology**

William S. M. Wold, Ph.D.  
Professor and Chairman

Dr. Rae Lyn Burke  
Chiron Corporation  
Department of Virology  
4560 Horton Street  
Emeryville, CA 94608

Dear Rae Lyn,

I have finally returned to my office and cleared off the stack of work on my desk. Thank you for providing the names of venture capitalists, and for contacting Rajen Dalal. I have decided to take the less visionary approach mentioned in your letter of June 10, 1994, and to request funding from Chiron for the gene therapy project on the adenovirus E3-11.6K protein that promotes cell death. The proposal is enclosed. I have submitted a patent application for this project; if the patent is awarded, it would provide protection in the U.S.A. but not in Europe or Asia.

Also enclosed is a budget for the proposal. I anticipate carrying out the research in my laboratory here at St. Louis University. However, other alternatives, including doing the work at Chiron, are also possible.

I have requested a consultant fee for myself and Dr. Ann Tollefson. Ann is an Associate Research Professor working in my laboratory; she is the co-discoverer of the cell death-promoting properties of 11.6K. She will co-direct the project and she will perform benchwork on the project. Note that our consultant fees are separate from the requested budget for the project.

I am also considering establishing a corporation, perhaps in August, with St. Louis University as a minor partner. If Chiron decides to fund this project, perhaps the funding can be channeled through this corporation. Therefore, the budget for the project should be considered to be tentative.

Our Biotechnology Transfer Office requires that an appropriate official from Chiron sign a confidentiality agreement. The form is enclosed.

Dr. Rae Lyn Burke

page 2

Thank you again for your interest, and for your hospitality during my visit.

With best regards,

A handwritten signature in cursive script, appearing to read "Bill".

William S. M. Wold, Ph.D.  
Professor and Chairman

WSMW:jl

enclosures

## BUDGET

### Personnel:

Lynda K. Hawkins, Ph.D.	\$20,700
TBA Postdoctoral Fellow	25,600
Fringes	9,955
Subtotal Personnel	56,255

### Supplies:

24,000

### Other:

Maintenance contracts and repair	1,200
Telephone, postage, photocopier demurrage	400
Radiation disposal	500
Publication, illustrations	500
Subtotal other expenses	2,600

Subtotal	82,855
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Indirect costs (10%)	8,286
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TOTAL	\$91,141
-------	----------

Consultant costs*	\$12,000
-------------------	----------

\*In addition to total project budget.

CONFIDENTIALITY AGREEMENT

THIS AGREEMENT is made by and between St. Louis University Medical Center having a principle place of business located at 1402 South Grand Blvd., St. Louis, MO 63140 and Chiron Corporation a corporation having a principle place of business located.....

THE PARTIES HAVE AGREED AND DO AGREE AS FOLLOWS:

1. This AGREEMENT refers to the work of Dr.....  
William S. M. Wold  
relating to adenovirus 11.6K protein that functions in  
promoting cell death.....
2. .... agrees to maintain the confidentiality of Proprietary Information discussed during their meetings. Proprietary Information shall not either be used or disclosed to any other person or entity without the written consent of the St. Louis University Medical Center except as may be required under a court order.
3. The confidentiality obligation shall not apply to:
  - a: Information which ..... can establish by reasonable proof was in its possession at the time of disclosure.
  - b: Public domain information or information which after disclosure becomes part of the public domain information by publication or otherwise except by breach of this Agreement.

The term and condition herein are acceptable to both parties of this Agreement as evidenced by the signatures of their authorized representatives:

Signature\_\_\_\_\_

Date: \_\_\_\_\_

Name: Aftab Alam

Title: Director, Biotechnology Transfer Research Center

Organization: St. Louis University Medical Center

Signature\_\_\_\_\_ Date

Name/Print\_\_\_\_\_ Title: \_\_\_\_\_

Organization:.....

## ADENOVIRUS E3-11.6K PROTEIN AS A CELL DEATH-PROMOTING AGENT

### A. BACKGROUND

The human adenovirus type 2 (Ad2) and Ad5 E3-11.6K protein (MW of 11,600) (Fig. 1) was first identified by our laboratory, using an antipeptide antiserum to immunoprecipitate the protein from adenovirus-infected cells (Wold et al., 1984). Subsequently, we have prepared three additional antipeptide antisera, we have isolated mutants that completely delete the gene, and we have constructed a series of about 20 mutants with truncations, small in-frame deletions, and missense mutations in the gene (Fig. 2; Tollefson et al., 1992; unpublished results). Using these reagents, we have shown that 11.6K is synthesized in low amounts during early stages of infection (prior to viral DNA replication), but in large amounts at late stages of infection (Tollefson et al., 1992). We have also shown that 11.6K is an N-linked O-linked integral membrane protein that initially localizes to the endoplasmic reticulum (ER) and Golgi apparatus, but ultimately localizes to the nuclear membrane (Scaria et al., 1992).

We have recently discovered that the 11.6K protein functions to promote cell death (A.E. Tollefson, A. Scaria, and W.S.M. Wold, manuscript in preparation). A representative experiment is shown in Fig. 3. As measured by release of lactate dehydrogenase (LDH), cells infected with wild-type adenovirus (*rec700*) begin to die at 2-3 days postinfection (p.i.), and are mostly dead by 5-7 days p.i. In contrast, cells infected with a mutant (*dl712*) that deletes only the 11.6K gene stay completely alive until 5 days postinfection, and they do not begin to die until 6 days p.i. Similar results have been obtained using, as indicators of cell death, the release of adenovirus from infected cells, trypan blue exclusion, the MTT assay (which measures mitochondrial activity), DNA degradation (agarose gels, DAPI staining, Apo-Tag), and light and electron microscopy. We believe that the function of 11.6K in adenovirus biology is to lyse

cells, thereby allowing adenovirus to be released from the infected cell.

Using our collection of virus mutants in the 11.6K gene, we are currently performing a structure-function analysis of 11.6K. Some of the mutants are shown in Fig. 2. The phenotypes of the mutants are summarized at the right side of Fig. 2. SDS-PAGE analysis indicated that all the mutant proteins are stable with the possible exception of *pm734.1* which only synthesizes residues 49-101 of the 11.6K protein (data not shown). These mutants have allowed us to map the protein domains required to target 11.6K to the nuclear membrane, and for 11.6K to promote cell death. Briefly, residues 41-59, the only hydrophobic domain in the protein, serves as the signal to insert 11.6K into membranes and to anchor 11.6K within membranes, i.e., this domain is a signal-anchor sequence. Residues 63-78, which includes the basic-proline domain (residues 63-74), a domain rich in basic amino acids and proline, is required to target 11.6K *specifically* to the nuclear membrane; mutant proteins that lack these sequences localize to *all membranes*, not specifically to the nuclear membrane. Regarding cell death, residues 1-40 and 71-101 can be deleted without abrogating the ability of 11.6K to promote cell death. Thus, the "death domain" appears to consist of residues ca. 46-60, with help from residues 61-74. However, we emphasize that although we have shown that these sequences are necessary to promote cell death, we have not shown that they are sufficient.

We do not understand the mechanism of action of 11.6K in targeting to the nuclear membrane and in promoting cell death. We believe that the nuclear membrane is the site of action of 11.6K because certain mutant proteins that do not exit from the ER or Golgi are defective in promoting cell death. Future studies in the laboratory will focus on the mechanism of action of 11.6K. This mechanism is not only of fundamental interest, but it may also



elucidate the cellular mechanisms that control cell death; this latter information may allow for novel gene therapy approaches for killing or protecting cells.

## **B. PROPOSAL**

Since the 11.6K protein can promote the death of adenovirus-infected cells, it has the potential use as a therapeutic agent to kill cells, e.g. malignant cells, in humans. This proposed research addresses two issues that must be resolved in order for 11.6K to be used as a therapeutic agent.

First, although we know that 11.6K promotes the death of *adenovirus-infected cells*, we do not know whether 11.6K can *function autonomously* to kill cells.

Second, since 11.6K functions inside the cell, apparently at the nuclear membrane, a means must be developed to deliver the protein to the cells of interest.

## **C. EXPERIMENTAL PROCEDURES**

### **C.1. Can the 11.6K protein function autonomously to kill cells?**

In order to answer this question, we have attempted to isolate human A549 cells stably transfected with the 11.6K gene. Several neo<sup>R</sup>-resistant cell lines have been obtained. These cells express only low levels of 11.6K, and the 11.6K protein is localized in the Golgi but not the nuclear membrane. Since we were not able to obtain cells that express high levels of 11.6K, or cells wherein 11.6K is localized to the nuclear membrane, these experiments suggest, but do not prove, that 11.6K can function autonomously to kill cells. We propose two approaches to address this question in more detail.

#### **C.1.a. Tet-inducible vector.**

We have obtained the *tet*-inducible vector system from Hermann Bujard

(Gossen and Bujard, 1992). In the *tet* system, the tetracycline repressor (tetR) was fused to the transactivation domain of VP16. In the absence of tetracycline, the fusion protein will bind to *tet* operators and will transactivate a promoter consisting of *tet* operators plus a TATA box. In the presence of tetracycline, the tetR-VP16 fusion protein does not bind to *tet* operators, and the promoter is silent. The major advantages of this system are that, upon removal of tetracycline, the gene is induced by up to five orders of magnitude. Also, induction is rapid, being >20% in 4 h and 100% in 12 h. Finally, the low amount (0.1  $\mu$ g/ml) of tetracycline required to keep the gene silent is unlikely to affect other properties of the cell. We will clone 11.6K into the *tet* vector, develop cell lines, and examine whether 11.6K is induced by removal of tetracycline, and whether 11.6K promotes cell death following induction. Cell death will be measured by release of LDH, trypan blue exclusion, the MTT assay, and microscopy.

If 11.6K alone does promote cell death, then we will proceed with the experiments described in Section D below. If 11.6K alone does not promote cell death, then we will proceed with the experiments in Section C.3.

#### **C.1.b. Adenovirus vector.**

There are two general classes of adenovirus vectors, nondefective and defective for replication in cultured human cells. The nondefective vectors generally have the E3 transcription unit (Fig. 4) deleted and replaced with the transgene. The E3 genes are not required for virus replication in cultured cells or in the lungs of hamsters or cotton rats, so these vectors are able to replicate. However, the E3 genes function to block the immune and inflammatory response to virus infection, so the E3-deleted vectors are more pathogenic than wild-type adenovirus.

Defective vectors generally have the E1A and E1B regions deleted and replaced with the transgene, and they have the E3 region deleted in order to increase the amount of foreign DNA that can be inserted into the viral genome (only 105% of the genome can be packaged). The E1A and E1B genes (E1B-55K) are essential for virus replication. E1A proteins are required to efficiently induce transcription of the other adenovirus transcription units. The E1B-55K protein is required for efficient transport of viral "late" mRNAs from the nucleus to the cytoplasm. Since the defective vectors lack E1A and E1B, they cannot replicate in ordinary cell lines or in animal models. The vectors can, however, replicate well in 293 cells, a human cell line that provides the E1A- and E1B-encoded proteins *in trans*.

Although E1A is required for *efficient* induction of transcription of the other adenovirus transcription units, transcription of these genes, including late genes, can occur at low levels in the absence of E1A. Indeed, recent animal model studies and Phase I human trials have indicated that defective adenovirus vectors do elicit an inflammatory response, presumably due to low level expression of adenovirus proteins.

Since we eventually hope to design an adenovirus vector to promote cell death, it will be important to limit the infection *in vivo* to the target tissue, and to minimize infection of healthy tissue. Therefore, the vector should probably be defective. The expression of the 11.6K protein could be limited to the tumor by direct injection into the tumor, or by use of a tumor-specific promoter to drive expression of the 11.6K gene. It is unclear whether the E3 genes should be included to minimize the normal inflammatory response (probably not), or excluded in order to maximize the response; this presumably would depend on the amount of infection of healthy tissue.

The design of an optimal vector is a topic of future experiments. At the present, we will use a simple "first generation" vector to address whether 11.6K expressed essentially alone can kill cells. This experiment differs from that described in Section C.1.a. because the vector will express other adenovirus proteins at low levels.

Our vector will have an Ad5 backbone, and it will be deleted in the E1A, E1B, and E3 regions. The 11.6K gene will be inserted into an expression cassette wherein transcription will be driven by the cytomegalovirus immediate early promoter, and the pre-mRNA will be processed using SV40 polyadenylation and splicing signals. The expression cassette will be inserted into the E1A/E1B region (Fig. 4), and plaques will be picked on 293 cells. Plaques of vector expressing 11.6K should be larger (more cell lysis and virus spread) than plaques from vector lacking 11.6K. Plaques will be expanded into virus stocks, and high-level expression of the 11.6K protein will be confirmed. Cultured human and mouse cells will be infected with the vector, and cell death will be monitored as described in Section C.1.a.

If 11.6K expressed from the adenovirus vector kills cells, then we will proceed with the experiments in Section D. If cells are not killed, then we will perform the experiments in Section C.3.

## **C.2. Mapping the minimal domain of 11.6K that is sufficient to promote cell death.**

Our studies with 11.6K mutants have indicated that a protein consisting only of residues 41-101 (i.e. lacking residues 1-40) localizes quite efficiently to the nuclear membrane and is about 50% as effective as the wild-type 11.6K protein in promoting cell death. A protein lacking residues 79 to 101 is completely wild-type for localization to the nuclear membrane and promotion of cell death. These results suggest that a version of the 11.6K protein consisting

only of residues 41-78 might be sufficient to promote cell death. It is important to determine whether this is so, because such a peptide, synthesized *in vitro*, might by itself be sufficient to promote cell death (e.g. by injecting the peptide into tumors). Also, such a peptide might be less immunogenic than the entire 11.6K protein. We propose to construct an adenovirus mutant that expresses residues 41-78 and determine whether this protein can promote cell death. This mutated gene will be inserted into the *rec700* background, as we have done for all our other 11.6K mutants, and it will be expressed from the *tet*-inducible vector.

**C.3. What is required in adenovirus-infected cells in order for 11.6K to promote cell death?**

If the experiments described in Section C.1. indicate that 11.6K alone cannot promote cell death, then some other adenovirus gene product or some unknown aspect of the adenovirus productive infection must be required in order for 11.6K to function. The following experiments will be performed to address these issues.

First, we will determine whether 11.6K overexpressed during early stages of infection can promote cell death. The 11.6K gene will be built into our mutant, *dl7001*, which lacks the entire E3 region but expresses all other adenovirus genes. We are using this mutant as a vector to express the E3 proteins individually (Ranheim et al., 1993). Cells will be infected with the *dl7001*-11.6K vector, maintained in cytosine arabinoside in order to inhibit viral DNA synthesis and keep the cells in the early stage of infection, and cell death will be monitored.

Second, we will attempt to map the adenovirus early protein(s) that must collaborate with 11.6K in order for 11.6K to promote cell death. We will infect cells with mutants that lack the E4 region, the E1B region, and the E1A region. We already know that

this putative "collaborating" protein is not encoded by the E3 region. These experiments are similar to those we performed to map genes that function to sensitize cells to tumor necrosis factor (Duerksen-Hughes et al., 1989) and to down-regulate the epidermal growth factor receptor (Carlin et al., 1989). If we determine that an adenovirus late gene encodes the "collaborating" protein then we will attempt to map the gene using available temperature-sensitive mutants.

#### **D. POTENTIAL FUTURE EXPERIMENTS**

The following is a brief description of possible future experiments. Which experiments will be attempted will depend on the results of the experiments in Section C. Most or all of these experiments will probably require additional funding.

##### **D.1. Design of an optimal vector to deliver the 11.6K protein to cells.**

We will attempt to optimize expression of 11.6K in our adenovirus vector, and we will construct vectors with tissue-specific promoters. We will explore whether the E3 region should be included in the vector, and whether a nondefective vector might be useful.

We will also attempt to express 11.6K from a retrovirus vector. Since retrovirus vectors only infect dividing cells, such a vector that expresses 11.6K might be particularly useful to treat brain tumors.

##### **D.2. Delivery of the 11.6K protein by direct injection.**

Since 11.6K has an internal signal-anchor sequence and it has only a short sequence that is C-terminal to the signal-anchor domain, 11.6K may be able to insert into membranes in a posttranslational manner. If so, then liposomes could be an ideal mechanism to deliver the protein to the interior of cells. The 11.6K protein might integrate into the

membrane of the liposomes, become fused to membrane vesicles within cells, and then be targeted to the nuclear membrane via its specific nuclear membrane localization signal. We will attempt this experiment using 11.6K purified from adenovirus-infected cells, where 11.6K is made in large amounts. Alternatively, 11.6K could be obtained from bacterial or baculovirus vectors.

If the experiment described in Section C.2. results in the identification of a minimal domain for 11.6K to function, then the minimal peptide will be synthesized *in vitro*. The peptide will either be incorporated into liposomes or added directly to cells, and cell death will be monitored.

#### **D.3. Coupling of the 11.6K protein to a ligand.**

In one of our adenovirus mutants (*dl718*), the stop codon for 11.6K is deleted; this results in the synthesis of a fusion protein consisting of residues 1-87 in the 11.6K protein fused to residues 14-91 of the E3-10.4K protein. This fusion protein functions nearly as well as wild-type 11.6K in promoting cell death. This suggests that 11.6K could be fused at its C-terminus to some ligand, e.g. EGF, and still remain functional. If so, then the ligand could be used to target 11.6K to specific cell types that express the receptor for the ligand. Thus, the experiment would be to express the 11.6K-ligand fusion protein in bacteria or insect cells, purify the protein, add the protein to the cells, and determine whether the protein is efficiently internalized into cells that express the ligand receptor, and whether the protein promotes cell death.

#### **D.4. Animal models.**

We have found that 11.6K does not localize to the nuclear membrane in

adenovirus-infected mouse or rat cells. This may imply that 11.6K must interact with a human protein in order to promote cell death. Lack of 11.6K function in mouse or rat cells is in one respect unfortunate because an animal model will be necessary to determine whether 11.6K can, for example, cause regression of tumors *in vivo*. We will infect cells of different species, e.g. cotton rat, hamster, and monkey, and determine whether 11.6K localizes to the nuclear membrane and promotes cell death. It may also be possible to examine human tumors growing in immunoincompetent mice. When we find a species where 11.6K is able to promote cell death, then experiments will be done in this animal model.

#### REFERENCES

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- Ranheim, T.S., Shisler, J., Horton, T.M., Wold, L.J., Gooding, L.R., and Wold, W.S.M. 1993. Characterization of mutants within the gene for the adenovirus E3 14.7-kilodalton protein which prevents cytolysis by tumor necrosis factor. *J. Virol.* 67, 2159-2167.
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that encodes an 11,600-molecular-weight protein in the E3 transcription unit of adenovirus 2.

*J. Virol.* 52, 307-313.

## FIGURE LEGENDS

Fig. 1. Sequence of the Ad2 E3-11.6K protein. The protein becomes integrated into membranes via its internal signal-anchor domain at residues ca. 41-59. The protein is oriented in the membrane with the NH<sub>2</sub>-terminus in the lumen and its COOH-terminus in the cytoplasm or nucleoplasm (the protein ultimately localizes to the nuclear membrane, but we do not know whether it is the inner or outer nuclear membrane). The site of N-glycosylation is indicated (NTT), as are the major sites of O-glycosylation. A domain rich in basic amino acids and prolines is indicated.

Fig. 2. Schematic representation of the Ad2 11.6K protein, as well as a subset of the mutants constructed in the 11.6K protein. For the wild-type protein (top figure), the major and minor O-glycosylation sites are shown, the N-glycosylation site is shown, the methionines at positions 1, 41, 49, and 56 are shown, the signal-anchor domain is shown, and the basic-proline domain is shown. Also shown is the orientation of the protein in the membrane, with the NH<sub>2</sub>-terminal region in the lumen of membranes, and the COOH-terminal region extending into the cytoplasm and/or the nucleoplasm. The deletions shown for the various mutants are indicated by the schematic. The two right columns in the figure indicate the approximate phenotype of the mutants with respect to their ability to promote cell death, as a percentage of the wild-type protein, and their ability to localize to membranes. Membranes shown in italics are the major sites of localization. NM refers to nuclear membrane, G refers to Golgi. The protein depicted at the bottom of the figure corresponds to the putative proteolytic processing product that arises following initial synthesis of the 11.6K protein.

Fig. 3. A cell viability assay for cells infected with *rec700* (wild-type) or two mutants,

*pm712* and *pm734.1*, which lack a functional 11.6K gene. A549 cells were infected with the viruses, then at different days postinfection cell lysis was measured based upon the release of lactate dehydrogenase (LDH) into the culture medium. The experiment shows that cells infected with *rec700* die (i.e. release LDH) much more rapidly than do cells infected with the two 11.6K mutants.

**Fig. 4.** Schematic of the Ad2 genome. The genome is a linear duplex DNA of 36,000 base pairs. *r* and *l* refer to rightward and leftward transcription, respectively. The split arrows indicate the spliced structures of the mRNAs (exons are shown). 289R, 19K, IIIa, etc. refer to proteins. E1A, E1B, E2 (A and B), E3, E4, and L1 (early) are "early" transcription units that are expressed prior to viral DNA replication. L1-L5 are families of "late" mRNAs expressed in the major late transcription unit. The 11.6K protein is translated from one of the E3 mRNAs at early stages of infection. At late stages of infection, 11.6K is translated from an mRNA that contains the major late tripartite leader (Tollefson et al., 1992).



Kostya, January 30

Project: Develop replicative vectors for cancer gene therapy.

### Progress achieved:

1) 3 rounds of transfection were performed with p626 (pBHG11 with E4 promoter substituted for CMV promoter). No plaques were obtained with this construct or pBHG11 as a control. I have prepared new stock of pAV56 (left-arm plasmid) and repeated the experiment 3 times more. Now waiting for results.

2) The plasmid containing E4 promoter- SPB promoter substitution was constructed (p82). It contains DNA of dl309 from BamHI to NdeI site (E3 region from dl309) and other part to the end of genome from pBHG11 with substitution of E4 promoter. 1 cotransfection experiment was done recently with 1101/1107 cut with EcoRI and pCMV/TTF. *Not done TTF yet*

3) Cotransfection of 1101/1107 cut with EcoRI and p54 (Lynda's plasmid pdlLKH Bam-end with insertion of Ad5 ADP gene) was done. Up to now (26 days) there are no plaques with either 1101/1107/EcoRI or with 1101/1107/EcoRI+ Lynda's plasmid (parental plasmid without insert of ADP). *With p54 there are 7 plaques* The plaques have been picked up and initial stocks of viruses prepared. Now the work is in progress to infect monolayers and characterize the genomes of this viruses. *approx. 2 week.*

4) I failed 2 times to construct the large plasmid with mutated gp19K on dl309 background. Now repeating the cloning.

*Assume*  
IDP inserted in XbaI site. Not start in TP.

### Proposed work:

1) To join Carol's and Mohan's work on 1101/1107 and pm975. I presume it would be interesting to do the same work on primary lung epithelial cells (GTI). SAEC - normal human lung small airway epithelial cells. *GTI get cells from GTI*

2) Start transfection experiments on Mohan's cell line (293 transformed with pCMV/TTF) to obtain the virus with E4- SPB promoter substitution. Characterize Mohan's 293-TTF cells on their ability to transactivate SP-B promoter (transfection and IP with anti-E4 ORF6 antibodies).

3) Start the work to obtain the plasmid with E1 on 1101/1107 background? Make the point mutation as in pm975? Try to substitute E1 promoter for SPB? Enlarge the CR2 deletion?

*GTI - infect cell line.*

Jan 31, 97

1

## Outline of Mohan's project:

### 1. C.F. project:

a) plasmid p $\Delta$ E1splA/3.7SPC Rep78 has ~2900 bp deletion. (Gautam's plasmid).

b) Construction of p $\Delta$ E1splA/3.7SPC Rep78 is in progress: Transferring the 3.7 SPC/Rep78 fragment to p $\Delta$ E1splA plasmid. Next week SPO/Rep78.

c) Preparation of  <sup>$\beta$ gal assay</sup> high titer BHK E3TR LacZ virus.  $1.4 \times 10^9$  pfu/ml. Done with 40 dishes.

Looks like virus does not grow well.  
Try again in KB cell/E1 growing in spinners.

KB/E1 - looks like may grow in spinners.

### 2. Cancer project:



#### a) Experiment 1:

a-1): Growing HEL 299 cells infected with dl 1101/1103.  
Showed CPE ~ 12 days.  
dl 309 showed CPE on 3<sup>rd</sup> day.

a-2): Growth arrested HEL 299 cells infected with  
dl 1101/1107 did not show CPE, till 17<sup>th</sup>  
day. dl 309 showed CPE on 8<sup>th</sup> day.

a-3): IF showed strong presence of fiber and DBP in ~ 50% of the growing cells (infected with dl1101/1107) on 14<sup>th</sup> and 17<sup>th</sup> day.

b) Experiment 2:

b-1): pm 975 infected growing HEL 299 cells showed CPE on 3<sup>rd</sup> day; dl 309 also showed CPE on 3<sup>rd</sup> day.

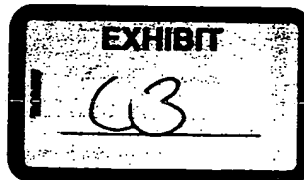
: pm 975 and dl 309 killed all the cells ~ 6<sup>th</sup> day.

, dl 1101/1107 showed CPE beginning ~ 12<sup>th</sup> day.

b-2): Till 10<sup>th</sup> day <sup>17 sup - still still no CPE</sup> no visible CPE was seen <sup>cells frozen. Next week plaque assay.</sup> in pm 975 and dl 1101/1107 infected growth arrested cells.

dl 309 showed CPE on 8<sup>th</sup> day.

b-3): Growth curve = Growing and growth arrested viral infected cells are being frozen for plaque assay.



c) Experiment 3:

c-1) HEL 299 growing cells are infected with PM975; dl 1101/1107: dl 309 and mock, at MOI of 100 pfu and 500 pfu/cell. 3<sup>rd</sup> of infection, at 100 pfu PM975 showed moderate CPE and ~90% CPE in 500 pfu infection. No CPE is seen in dl 1101/1107 infected cells at 100; and 500 pfu/cell. (7<sup>th</sup> day) dl 309 showed CPE on 3<sup>rd</sup> day (100 pfu) and 90% CPE in 500 pfu infection.

Growth arrested cells will be infected today.

Plaque assay not work.



Gene Therapy - Group Meeting 9/10/2001

Took 1 h 20 min

Karoly 2/17/97

Did not  
make Adluc  
14.7 in  
EIAE3 viruses

- I have made cell stock of pGluc(D-) 14.7 and NP6K pp19K ap
- titring is under process (NP6K pp19K ap  $\approx 10^9$ )
- going to make Ad lac Pol RID and Ad lac Pol 14.7 RID in E3 region. No band in Cell.
- Bai - CMV-14.7 CMV-RID. Have clone. Make virus.

FasL projectFasL  
30-transfected 293  
10.4/11.5 plasmid  
PCR (Bai made)  
cells died.

- I have cloned mouse FasL in pGL then the CMV-mFL-PolyA cassette in a left end plasmid containing p-Gal and VARKAI-II
- Transfected this construct in 293  $\rightarrow$  the cells died
- I could not show mFL in a transient transfection assay (293 cells, Western blot with anti human FasL) but the protein could be detected in an in vitro transcription-translation reaction using the same plasmid and antibody
- Transiently transfected MCF-7 and MCF-7 Fas cells die at the same rate. No cyclo treatment is needed
- I am going to try MCF-7 CmuA first in transient transfections, then make a cell line. This cell line can be used as an "activated CTL" in Fas experiments
- I am making a CmuA-293 line

EXHIBIT

C5

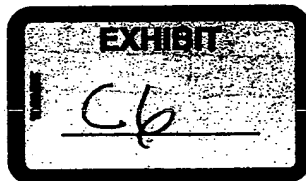
Cancer Therapy project

- It seems that the V138 I use is too high passage. Only a proportion of the cells divide, the majority is senescent. I have ordered a new batch from ATCC.



February 14, 1997 Kostya

- 1) Up to now I have no plaques after transfections with p626 (E4  $\rightarrow$  CMV promoter substitution). And I have no plaques with pBHG11 as a control.
- 2) I am preparing now DNA from cells infected with 10 plaques resulting from cotransfection of 1101/1107 DNA cut  $EcoRI$  with pS4 (Lynda's deletion of E3, insert of ADP gene).
- 3) I have plaques after cotransfection of 1101/1107 DNA cut  $EcoRI$  with p82 (E4  $\rightarrow$  SP-B) promoter substitution. Control (1101/1107 cut with  $EcoRI$ , to experiment ratio is 3:10 now but in dishes with p82 plaques are still appearing (3 weeks).
- 4) I am working on Moken's cells (293 CMV/TTT), have done one cotransfection of 1101/1107 /  $EcoRI$  p82 on these cells.
- 5) Cloning experiments to obtain large plasmid suitable for cotransfection with gp191C mutated are in progress.



Feb 14, 97

# Outline of Mohan's Project:-

1. C.F. project:
- RNA analysis of Rep78 antisense
  - Hist- photograph of passage ( $10^4 \times 10^9$ ) titered on 293 cells. 80 dishes
  - a) Screening colonies for 3.7SPC/Rep78 insert in pXELSP1A.  
36 colonies are under screening; Some colonies have the insert; Screening more colonies & characterization
  - b) SPB promoter = PCR; strategy to determine function of Rep78.

Mohan - KB/E1A plasmid - doing ok. Still in tube (60 ml). Not in spinner yet. 293 suspension culture. Grows slow. Forms clumps at  $5 \times 10^5$  cells/ml.

## 2. Cancer project:

### Experiment #3:

Growing HEL 299 cells: 14<sup>th</sup> day (2/14/97)

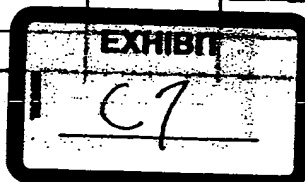
- a) pm 975 (100 & 500 pfu) Killed all the cells.
- b) dl 1101/1107 (100 pfu) & CPE starts; in 500 pfu - shows CPE. (better than 100 pfu)
- c) dl 309 (100 & 500 pfu) Killed all the cells.

Growth arrested HEL 299 cells: 7<sup>th</sup> day

- a) No CPE in dl 1101/1107 (100 & 500 pfu);
- b) No CPE in pm 975 (100 pfu);  
CPE shows in 500 pfu. Same as 309 at 500 pfu.
- c) No CPE in dl 309 (100 pfu)  
CPE shows in 500 pfu.

### Growth Curve:

Dishes are processed; Going to do plaque assay



Kordy 2/14/97

E3 viruses

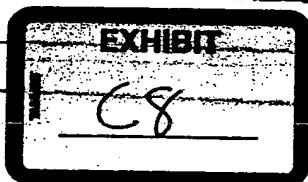
- Titer of N P6K pp13Kexp is  $1.37 \times 10^9$
- $\beta$  Gluc(D-) 12.7 is less than  $10^7$  (?) (will repeat total exp.)
- We are trying to make virus with the plasmids made by Bai
- We are assaying for expression of 12.7 and RID in a Western

FosL project

- I tried the infection-transfection experiment twice. I failed both attempts because the virus killed the cells before I could transfect. I used 50 pfu/cell (233), 20  $\mu$ g/ml Ara C. The cells were rounded up after 18h (1st exp.) and 7h (2nd exp.) 5 PFU. MCF7 cells. FokI supernatant. 293/cmA cell line.

Cancer Therapy project

I have got V138 from ATCC. I am growing them up. Got cell proliferation test-stains for BclR.



Kostya

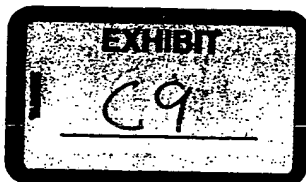
1) I have made and analyzed by restriction and  
 PCR ~~from~~ Hirt DNA preps from 5' of 10 plaques  
 that I had after p54 <sup>(Lynda's plasmid + ADP)</sup> cotransfection with "01/1109/R1".  
 2 plaques were wt with addition of something  
 that I suggest is defective version of recombinant  
 virus. 3 other plaques contain E3 from p54.

2) I'm <sup>Have 10 plaques - half small, half very small. One month. The transfection was complicated.</sup> picking up plaques resulting from <sup>transfection</sup>  
 of p82 (E1k → SP-B promoter substitution). <sup>CO-transfected G41-  
 cut 01/1109  
 also transfected TFF1.</sup>  
 Expt is being repeated - xpt is 3 weeks old; Had some plaques.

3) Failed to construct large form of gp19K \*  
 plasmid due to contamination of competent cells  
 with something Amp<sup>R</sup>. Now prepared new batch  
 of competent cells, about to repeat cloning.

Ad/ADP recombinant in "Lynda's plasmid, A E3, + 11, deletion extending like p3000".  
 Has 4 plaques, 2 are recombinant (Hirt, PCR), 2 seem to be mix of wt and recombinant  
 with a deletion. These plaques give strange appearance, as if they are secreting  
 a factor that kills surrounding cells in trans.  
 Lynda's plasmid - not even sure that G4 is present.

Kostya - will plaque - identify the "mutant" and "mixed" plaques.  
 The two mutant plaques are very "slow" - may not be good tailer virus.



New Energy Group Meeting 9/22/21

(pCI) CMV-ubiquitin spec-SV40 polyA  
Koroly 2/21/8

### ES viruses

- Western with the pCI RID and CMV-  
was negative - I am doing an IP in pCI501A  
These are the constructs that Dai made.

### FasL project

- The shudded mFasL is not toxic
- I am trying to make virus with mFasL in left-end plasmid and dl7001

It is known that the human FasL is toxic, the ~~mouse~~ <sup>shudded</sup> FasL is not. Killing by FasL is very fast.

All MCF-7 cell lines die when transfected with vector/FasL except the one in CmtA.

They die in one day.

25-50% of the cells die.

Will do left in MCF-7/143K cell line.

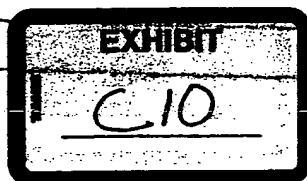
Try any MCF-7 cell line expressing RID2 or RID3?

Could try to repeat this left in A549, even if transient transfection is poor.

Karl-meching 83 cells expressing CmtA.

MCF-7/CmtA/FasL - have colonies.

- Transfect with RID + LDNGFR, purify, then transfect with FasL.



## Mohan's project.

Feb 21, 97

## 1. CF. Project:

a) Final plasmid p $\Delta$ ELSP1A/3.7SPC Rep78 has been constructed; plasmid preparation is under progress.

## 2. Cancer project:

## Experiment #3:

Growing HEL 299 cells 21<sup>st</sup> day

a) d1101/1107 shows better CPE in 500 pfu than 100 pfu.

b) pm 975 & d1309 killed the cells.

Growth arrested: 14<sup>th</sup> day

a) NO CPE in pm975 (100 pfu).

At 500 pfu at 14<sup>th</sup> day cells are killed.  
BPE starts at 3rd day -> Lethal dose. Cells dead at 12 days.

b) NO CPE in d1101/1107 (100 & 500 pfu)

Growth Curve:-

pm 975 - infected G & GA. HEL 299 cells:

Growth Curve is done; waiting for plaques.

Will not do growth curve for d1101 - will do next month.

Northern blot will be done for Rep78 antisense cell line  
Trying to clone SPB/Rep78 into p.

EXHIBIT

C11

12-28-91 Kostya

Need to do Hirt on some of these plaques.

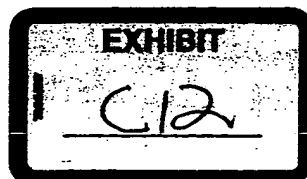
1) I have analyzed by PCR 8 of 10 plaques which I had after 1101/1107 cut with EcoRI + p82 (E4 → SP-B promoter substitution, E3 from dl 309). They all contain wt E4<sub>prom</sub>. And I have no up to now plaques with p626 (E4 → CMV promoter substitution, E3 from pBK611). Determine RHE sequence of Neppan's plasmid.

1) I am going to put different variants of E3 that I have in ~~other~~ <sup>small</sup> plasmids (dlE3 X60 + ADP, dl 309 with gp19K mutated, wt?) into Linda's plasmid with which I have obtained a recombinant virus.

1) I would propose to start the work toward E1 promoter deletion and substitution with SP-B or any other tissue-specific or tightly regulated promoters. As alternative we can try to substitute E2A promoter.

1) Growing up ADP mutants vector.

BLAST. lipoxygenase - 3 diff species.



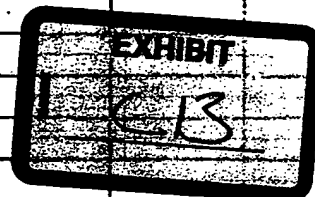
Mohan,

Feb 28, 97,

## 1 C.A. Project:

a) Preparation of pKESplA/SPC Rep78 is progressing.  
Some problem in CSCI banding. Repeating another prep.  
Saw 4 bands - good band.

b) Construction of SPB-Rep78 plasmid.  
: partial digestion of p3.7SPC/SPC with HindIII -



## 2. Cancer Project:

## Experiment #3:

Growing HEL 299 cells 28<sup>th</sup> day

a) di 1101/1107 shows CPE in 500 pfu  
and 100 pfu

1101/1107  
good CPE  
at 500 pfu

Growth arrested cells:- 21<sup>st</sup> day.

a) pm 975 at 100 pfu shows ~ CPE?

b) NO CPE in di 1101/1107 (100 & 500 pfu)

Growth Curve:- pm 975 100 pfu. On 293 cells.

Growing:  
Total cell + supernatant  
3<sup>rd</sup> day =  $7.1 \times 10^4$  pfu/ml  
5<sup>th</sup> =  $1.3 \times 10^5$   
6<sup>th</sup> =  $1.1 \times 10^5$   
7<sup>th</sup> =  $7 \times 10^6$

Growth arrested:

1101/1107  
very low  
showed  
need to stain more well.

Need to check 1st & 3rd day.  
10<sup>th</sup> day =  $1.2 \times 10^5$  pfu/ml  
14<sup>th</sup> =  $3.2 \times 10^5$   
19<sup>th</sup> =  $1.8 \times 10^5$

K13/1A are  
GFP positive  
Not present from 293 cells  
Froze  
from Microbot.





3/7/97 Kostya

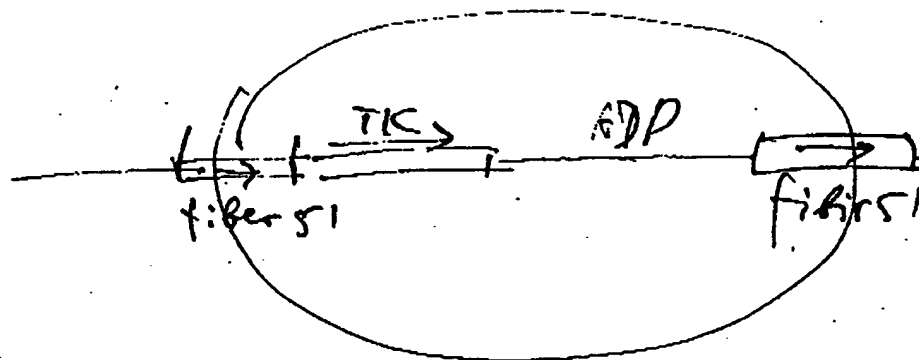
- 1) Cloning of ITR PCR product to p82 (EU-SPB promoter plasmid) is in progress.
- 2) I have a problem with TK, cannot PCR it from Linda Morrison's plasmid. If it is possible, I would like to have a plasmid with HSV-1 TK gene from GT1.

- 3) Plaque assay of S44 (virus with Lyda's E3 deletion + ADP insert) on 293 cells.

(309, 1108/1107) (wt control) <sup>Lyda's deletion</sup>  
 12.5K, 14 polyA  
 nro, mutate, rebase

(S44) develops plaques a bit slower than wt, plaques appeared 1-2 days later than in wt, day 16 - plaques are ~ 8-10 mm in diameter.

(7001) - plaques are tiny (1-2 mm) at day 16.



EXHIBIT

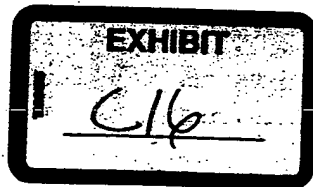
C.15

22-141 50 SHEETS  
 22-142 100 SHEETS  
 22-144 200 SHEETS



Kostya

- 1) i) Results of cotransfection 1101/1107 /EcoRI + p54 (dlE3 + ADP) → 4 more plaques were analyzed. 3 of them contain recombinant genomes.
- ii) Subcloning of dl 309 E3 with gp19K mutated and dlE3 Xba + ADP into Linda's plasmid is in progress. When the plasmid with 19K\* is made I'm going to insert HSV-1 TK into PstI site created in gp19K gene.
- 2) i) No plaques with p62B (pB4611 E4 promoter → CMV promoter). No plaques with pB4611 as a control.
- ii) 4 more plaques resulting 1101/1107 /EcoRI + p82 (E4 → SP-B promoter) were analyzed. All contain wt genomes.
- iii) In 2 repetitions of cotransfection 1101/1107 with p82 (E4 → SP-B promoter) no plaques neither in control nor in experiment. 2nd experiment was done on Moken's 293/CMV-TTF cells. Now repeating the cotransfection.
- iv) Sequencing of Nippon's plasmid p21 (E4 promoter dl) is in progress to prove that right Ad ITR is intact in the plasmid.
- 3) Growing initial stocks of the recombinant virus with dlE3 + ADP.



Kathy 3/7/97

E3 viruses

- I have transfected p-Gal P66 147 ap and p-Gal P66 R109 (with B4611) I am waiting for plaques.
- Still no plaques - Bai's constants. Now 3 weeks old.

Fowl project

- The pC1R10 construct did not protect against killing induced by pC1mFowl transfection (293 cells)

Exp 1. - Transfect with 5  $\mu$ g R10

- wait 24h

- Transfect with 5  $\mu$ g mFowlExp 2 - Transfect with 5  $\mu$ g R10

- wait 24h

- split the cells

- wait 24h

- transfect with 0.5, 1, 2, 5  $\mu$ g mFowl

- The MCF7 14.7 cell line (Terry) is not protected from killing with mFowl.

- I am trying to show functional R10 in transfected cells (IP, IF).

- I am ~~also~~ trying to show 14.7 in Terry's line (IF).

- I am expanding colonies isolated from 293Gm A and MCF7 control mFowl transfections.

- I am growing up virus (putative mFowl - p-Gal 7001) isolated from blue plaques.

Cancer therapy project

- 11/01/07 on 14.738 growing 10th day, arrested 7th day - no difference (no CPE). It seems that there might be a diff.

EXHIBIT

C17



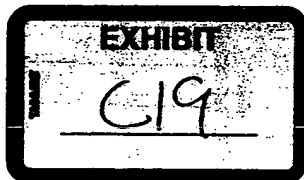
I E3 region:

- i) Initial stocks of the viruses with dlE3, ADP insert are prepared. Plaque assay on 293, A549 cells with 1101/1107, dl309, ADP<sup>-</sup> viruses as controls is to be started.
- ii) Two large plasmids suitable for cotransfection with viral DNA based on Lytle's plasmid with E3 a) from dl309 with sp19K untagged b) dlE3 Xba + ADP<sup>KD3</sup> are made. CsCl preps of these plasmids are done. Cotransfection of these plasmids with 1101/1107 DNA / EcoRI is in progress. Will do one to TK gene, one PacI site.

II E4 - SP-B promoter:

- i) There were 4 plaques which are developing CPE very slow in plate wells (Incomplete CPE in 3 weeks).
- ii) Alternative project: E1 → SP-B (SP-C) promoter substitution. There was an article by David Solnick with E1 → MLP substitution (deletion E1 promoter -45 → +8 relative to E1 cap site).

However, I would propose to try to express E1A under the control of SP-B or SP-C in place of standard E1 deletion. Advantages: a) E1B would be completely deleted in the virus b) It is possible to use 13S cDNA (express only 289 aa E1A)



Kordy 3/14/

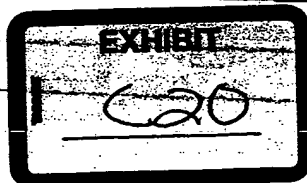
Fasl project

- I did an IF with A548 and 293 cells transfected with pCONA3 RID $\alpha$ , pCONA3 RID $\beta$  (alone and together) and pCIRID. The results are inconclusive. I could see <sup>strong</sup> RID $\beta$  expression where it was present, but the localization was mostly Golgi, even if RID was supposed to be there. (This was not easy to judge in 293. The IF did not work in A548). The EGFR internalisation did not work because of the antibody. I am going to repeat this experiment in MCF-7.
- I have labeled IP RID $\beta$ , look for co-IP of A548.
- I have not processed them yet.
- Fasl virus: I am doing a plaque assay with the isolated, blue virus.

Harding's test 893/omit clon. Enough antibody? Transfect: Fasl-seu if

Cancer Therapy project

- 11/01/11/07 don't grow in primary cells. Perfect.
- I am doing an IF with <sup>DOPI, Biotin incorporation</sup> 1101/07 infected U138.
  - Growing U138 infected with 500 pfu/cell 1101/07 shows no real cpe on day 15.
  - Growing U138 infected with 100 pfu/cell, 175 shows cpe on day 3.



Gene Therapy Group Meeting 970314

Mohan, 3/14/97

1. C.F. Project:

- a) pDE1SP1A/3.7 SPK Rep78 has one additional Kho1 site; Co-transfected with pBK610 in 293 cells.  
 Give to Telen - Western for E1A and E1B-1A.  
 b) KB MAT E1 Spinaery cells, frozen same, my promoter. Bacterial =  
 c) RIA (293 Rep78) - transferred; synthesizing the RIA probe in progress.

2. Cancer project:Growth Curve: pm 975 Growing:

total Cells  
 Day 1 =  $8 \times 10^4$  pfa/ml (New) Day 1 & 5  
 Day 3 =  $7.1 \times 10^7$  309 is now being  
 " 5 =  $1.3 \times 10^7$  titrated.  
 " 6 =  $1.1 \times 10^7$  Day 6 - all  
 " 7 =  $7 \times 10^6$  cells are floating.

Growing:

Day 1, d1 1101/1107

Day 3, d1 1101/1107

Day 1, d1 309

Day 5, d1 309

These points  
 are being  
 titrated by  
 stain next time!

Growth arrested:

GA 1 DAY = d1 1101/1107

GA 1 Day = d1 309

GA 5 Day = d1 309

Need to call Bruce.





3-21-97

Kostya

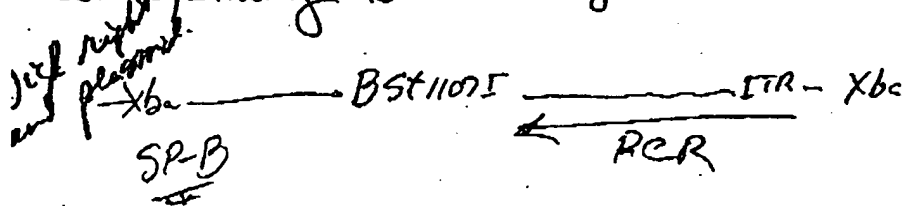
1) Sequencing of p21 (Nriippen's plasmid, EcoRI-B fragment of pBUG11, EU <sup>12-14 kb</sup> promoter deleted).

Primers directed to deletion point. <sup>SalH</sup> <sup>SP-C</sup> <sup>SP-B</sup> <sup>CMV</sup>

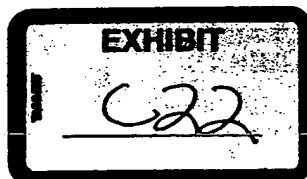
i) Ad5 sequence is OK ~ 600 bp downstream <sup>the deletion.</sup>

ii) Upstream the deletion Ad5 sequence 35770 → 35858 is as predicted. Upstream of Ad5 35858 at there is sequence which is *E. coli* <sup>transposon 5.</sup> <sup>in ITR.</sup> Tus according to BLAST. Probably, ITR is in plasmid but it can not be concluded from this sequence. Moreover, even if it is there, Tus is inserted -77 bp from the right end of ITR <sup>Tus is at least 500 bp or more upstream.</sup> making it not recognizable to virus.

2) It is possible to cut out defective sequence from p82 (large plasmid with SP-B promoter) with Bst1107I and XbaI and put PCR product corresponding to Ad5 right ITR in single cloning.



Nriippen-site in  
Gal4 promoter.  
Review Gal4 project.



Kardly 3/25

Fast project

- I have transduced 12 283 crmA clones and got partial protection in 7 of them. I will run a Western blot.
- I have tested 15 MCF7 crmA-mIL clones in a Western blot (using a hFast). All seem to be negative. I will try mixing experiments.
- mFast viruses: no blue plaque in 2nd plaque purification.

Lower therapy project

- Growing V138 infected with 500 pfu/cell 11/01/07: no CPE and
- Arrested V138 infected with 100 pfu/cell on 9/5: no CPE and
- Cell proliferation assay (BrdU incorporation  $\rightarrow$  IF) shows that growing V138 is not really growing.

EXHIBIT

C23

Moham, 3/21/97

1 C.F. Project:

1st transfection was done last week  
 a) 2<sup>nd</sup> transfection was done in 293 cells;  
 pBHG10 + pAE1Sp1A/3.7 Sp1 Rep78

b) Northern Blot: for 293 / Rep78 cell line, expressing  
 Rep78 Antisense RNA; blot is exposed to film.

c) checking E1 expression in KB MUTV E1 spinner cells. Can.  
 induced by dexamethasone → samples given to Tindor  
 Grow E1/EC cassette, check: Start = 5TP

2 Cancer Project:

Growing 1 day: d1309 =  $4 \times 10^4$  pfu/ml  
 5<sup>th</sup> day: d1309 =  $4 \times 10^6$  pfu/ml

Growth arrested: 1 day d1309 =  $1.4 \times 10^5$  pfu/ml  
 5<sup>th</sup> day d1309 =  $1 \times 10^6$  pfu/ml

Growing day 1 = d1101/07 =  $4 \times 10^4$  pfu/ml

Growth arrested day 1 = d1101/07 =  $1.2 \times 10^3$  pfu/ml

Buy spinner from MG

EXHIBIT

C24

## Growth Curve: HFL 299 cells

Growth:		pm 95	d1104	d1349	pfu/ml	all (100 pfu)
Day 1		$8 \times 10^4$	$4 \times 10^4$	$4 \times 10^4$		
" 3		$7.1 \times 10^7$				Repeat @ 500 PFU
" 5		$1.3 \times 10^7$	$1.4 \times 10^4$	$4 \times 10^6$		Do ~ 3-10A - to identify back ground
" 6		$1.1 \times 10^7$				Make CPE data @ 90 PFU
" 7		$7 \times 10^6$				
10						Repl - next week @ WI 38
15			$4 \times 10^4$			
19						
23			$1.3 \times 10^6$			
24						
Growth arrested		Days				
		1		$1.2 \times 10^3$	$1.4 \times 10^5$	
		3				
		5		$1.1 \times 10^3$	$1 \times 10^6$	
		6				
		7				
		10	$1.2 \times 10^5$	$1.4 \times 10^3$		
		14	$3.2 \times 10^5$			
		15				
		19	$1.8 \times 10^5$	$8.4 \times 10^3$		
		23		$5.6 \times 10^3$		

EXHIBIT

C25

Mohan, 4/4/97

1

C.F. Project:

a) 3<sup>rd</sup> Transfection was done; *3 transfections going simultaneously*  
 Next week 17-20 days, should start seeing plaques.  
 (then 1st transfection) On 293

b) Northern blot: 293 cells expressing antisense Rep78;  
 RNA from 293 cells itself, gave hybridization  
 signals (bands) with sense and antisense Rep78  
 RNA probe. May be RNA contamination? or  
 unspecific bands?

293 cells transfected again c Rep78 antisense  
 (pCDNA3 Rep78); when the G418 resistant  
 colonies form, individual colonies will be  
 propagated for the above RNA studies (or PCR).

c) checking expression of EI in KB MMTV EI spinner cells.

i) KB MMTV EI cells induced with dexamethasone  
 expressed EI B 19K; for EIa expression the  
 antibody (-Tudor) is not good.

ii) I made a B46E3 ITR LacZ virus prep from  
 KB MMTV EI spinner cells (~1.5 liter); so EI is  
 functional in these KB MMTV EI spinner cells.

iii) From 3 liter KB MMTV EI spinner spinfect, 0.15 ml  
 dexamethasone for 34 hrs gave viral band same as above

2.

Cancer Project:

Experiment 3: HEL 299 growing and growth arrested  
 cells are infected with dl104/mut; dl1304  
 (500 pfa/cell) = under progress for  
 Growth Curve experiment.

Need graph/table for trip to G.T.I.

EXHIBIT

C26

FasL project

- I did a Western with the 293 CmnA clones, they all express CmnA. I will cotransfect them to make FasL virus.
- Use this cell line to make Ad-FasL vector, perhaps Ad-14.7k and Ad-RID vectors.
- Transfect FasL into cells. 1st exp. - got protein.

E3 proteins

- I have isolated plagues from CMV RID and CMV 14.7 transfections and VRID and V 14.7 transfections.  
Nippon RID  
Pot. promote, R → L activation
- Expression of RIDα from the CMV RID construct is ~~not~~ not proven yet.

Cancer Therapy

- I am liking 1101/1107 yields on W138
- There is some CPE in p875 (100 µm) infected W138 on day 15

Make Ad vector (gene therapy) that expresses CmnA.  
Use for gene therapy to keep transduced cells alive.

Lynda's expression cassette

all promoter, all Ad E3 genes. 1st 293, then PKF-7.  
Do IP

22-141 50 SHEETS  
22-142 100 SHEETS  
22-144 200 SHEETS



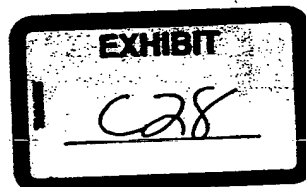
EXHIBIT

C27

4/11/97 Kostya

- 1) Cotransfection of 1101/1107 / EcoRI + p101  
(dl 309 E3, gp19K mutated) or p111 (dLE3 X62 + ADP):  
There are 1 plaque with 101 and 1 plaque with 111  
and no plaques in control dishes. Now amplifying  
these plaques to analyze the genomes.
- 2) Need TK Hsd-I gene from GT1 (if possible, with  
sequence and plasmid map). I'm going to insert  
the TK gene in PaeI site of p101 (in gp19K gene)  
and XbaI site of p111 (~~before~~ upstream from  
ADP insert).
- 3) Failed once to replace Tus sequences with  
ITR in p82 (dLE4 promoter, SP-B promoter insert),  
now repeating the cloning.

22-141 50 SHEETS  
22-142 100 SHEETS  
22-144 200 SHEETS



Mohar 4/11/97

Gene therapy Meeting1. C.F. Project:

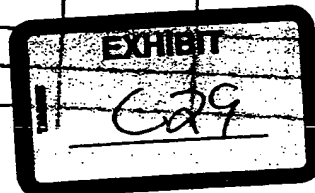
- a) Three different transfections were done to make construct Rep78 virus. No plaques yet in one transfection (24 days) <sup>transfection</sup>
- b) dishes showed CPE like? in ~ 16 days; plaque titrations were done. started 4-11-97
- c) 293 Rep78, antisense cell line were brought from the freezer; going to repeat the above transfections in Rep78 As. cell line.
- d) primers are ordered for checking ADV Rep78 in 293 cell line.

2. Cancer project: HEL 299 cells, 500 pfu.

- Growing cells showed good CPE at ~ 15 days (4/10/02)
- Growth arrested cells ~ 11<sup>th</sup> days very little CPE?
- dishes are being frozen for growth curve data

3. KB MMTVEI:

pBabe puro plasmid is under preparation for Co-transfection with ~~EL~~ plasmid; pCina plasmids.





How pdt-<sup>spike</sup>, cell <sup>stock</sup> titer  $1.4 \times 10^7$ 

Keroly 4/11/87

E3 proteins

Do I? of this vector, compare to Ad5.

Need  
to repeat

- Tested two VEGK 14.7 viruses for  $\beta$ -gal-act
- Tested 3 CMV 14.7 and 4 CMV R10 viruses for  $\beta$ -gal - none of them expresses.
- I have tried to sequence the CMV-R10 construct, did not work. Lytle - point mutations in entire E3 region of Ad5. Need to do this, only promoter.

FoxL project

- I have a <sup>mixing</sup> ~~mixing~~ experiment running w/ MCF7 - Luma - FoxL cells, so far it's a may be.

Cancer Therapy

Preliminary titers:

Growing <sup>U138</sup> ~~U138~~ infected with 500 pfu/cell 1101/1107

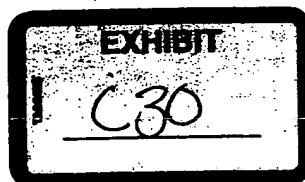
D <sub>5</sub>	<	$10^5$
D <sub>3</sub>	$\approx$	$1 \times 10^5$
D <sub>7</sub>	$\approx$	$3 \times 10^5$
D <sub>10</sub>	$\approx$	$2 \times 10^5$
D <sub>15</sub>	<	$10^5$
D <sub>20</sub>	$\approx$	$8 \times 10^5$
D <sub>25</sub>	$\approx$	$1.5 \times 10^6$
D <sub>30</sub>	$\approx$	$5 \times 10^5$

Quiescent U138 infected with 500 pfu/cell 1101/1107

D <sub>15</sub>	<	$10^5$
D <sub>20</sub>	<	$10^5$
D <sub>30</sub>	<	$10^5$

no plaques at  $10^{-5}$  dilution.

Will have Ad5 data on U138 next week.

22-141 50 SHEETS  
22-142 100 SHEETS  
22-144 200 SHEETS

4/18/97 Kostya

1) Plagues, resulting from p101 (gp 19k mutated) and p111 (Xba d(E3 + ADP): I have Hirt preps of genomes of these viruses, now analyzing by PCR and restriction digestion.

2) I have got clones with T<sub>u</sub>S → ITR substitution. Going to analyze them.

3) Starting to construct plasmids with Ad5, pm 760 RID genes under the control of CMV promoter. Same with the 14.7 gene.

Kostya will put E3 transcription unit, containing the pm 794.1 ADP mutations, behind the CMV promoter, for the purpose of inserting into E1 region of BHG11 (or 10).



1X only 4/10/04

E3 proteins

- I am going to test more MP6k 14.7 and MP6k R10 viruses. (I am infecting today.)
- I did an IP with MP6k p18k virus, no band on ON exposure.
- I have got the oligos for sequencing the CMV R10 construct, I will do it this weekend.

FasL project

- I am growing up 293 cells and making a (51) stock of the plasmid (CMV in FasL in left hand plasmid)

Cancer therapy projectPreliminary titers WI-38

		1101/1107	500 PFU/cell	975		100 PFU/cell	308
	A	G	A	G	A	G	
D1		$1 \times 10^5$	$1 \times 10^5$		$3 \times 10^6$		
D3		$5 \times 10^5$					
D5			$1.5 \times 10^5$		$1 \times 10^7$		
D7		$3 \times 10^5$				$3 \times 10^7$	
D10		$4 \times 10^5$	$1 \times 10^6$				
D15	$< 10^5$	$< 10^5$	$2 \times 10^5$				
D20	$< 10^5$	$8 \times 10^5$	$8 \times 10^5$				
D25		$2.5 \times 10^6$	$7 \times 10^5$				
D30	$< 10^5$	$7 \times 10^5$					

EXHIBIT

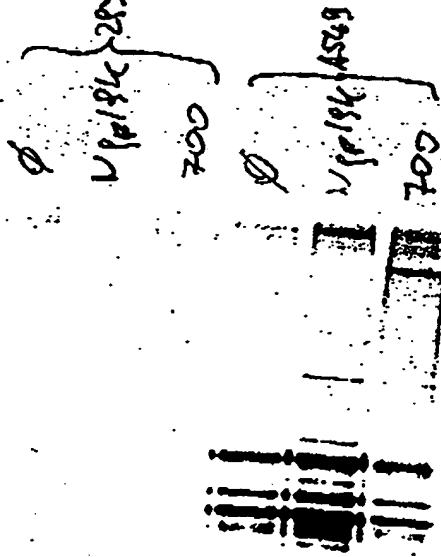
C32

 22-141 50 SHEETS  
 22-142 100 SHEETS  
 22-144 200 SHEETS


KODAK SAFETY FILM 350

KODAK SAFETY FILM 350

4/18



Could see by IF, beginning at 2 days pi

EXHIBIT

C33

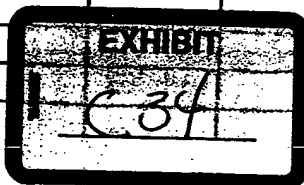
Moham, 4/18/97

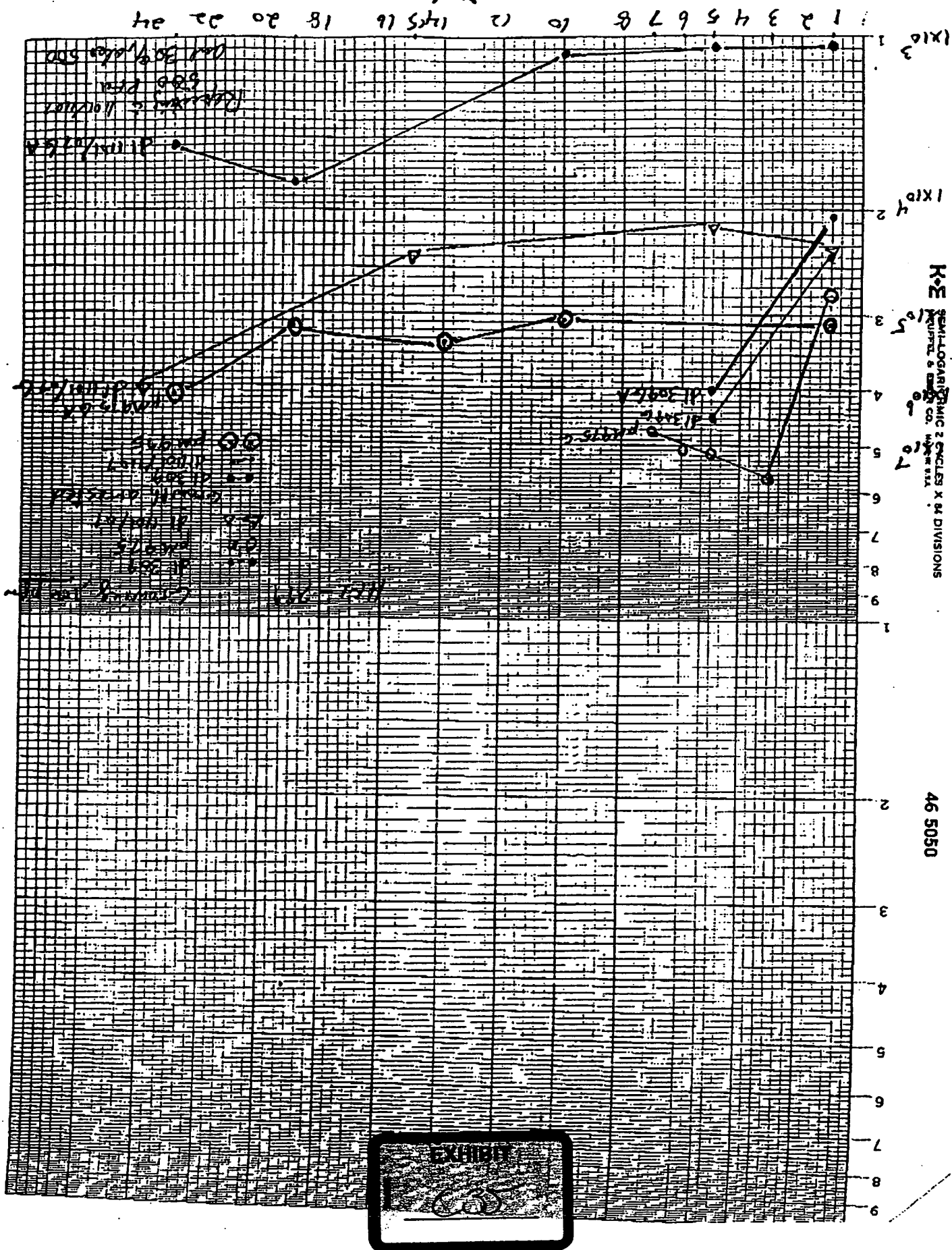
1. C.F. Project:

- a) No plaques in 293 cells co-transfected with pBHG10 and pAE1SpA/3.7 SpC Rep78. (~ 30 days and 24 days); 3<sup>rd</sup> transfections (18<sup>th</sup> days) dishes are stained; waiting for plaque plaques.
- b) Cells showed CPE like effect (pBHG10 + pAE1/SpC Rep78 were titrated and not stained yet. But even undiluted dish did not show CPE.
- c) RT-PCR showed no Rep78 dist fragment in 293 and 293 ΔRep78 AS. cell lines.
- d) Spinner KB MMTV ET cells - virus IR LacZ is ~~not~~ in spinner; Karl virus is going next.
- e) pBabe puro plasmid is made in large quantities; for transfecting the KB ET cell line with ET and CMV plasmid separately.

2. Cancer project - HEL 299 cells; 500 pfa  
 - Growing cells were dead at ~ 21 days.  
 - Growth arrested cells 18<sup>th</sup> day. On 21<sup>st</sup> day cells will be frozen for Growth Curve analysis.

3. preparations: plasmid BHG10, BHGE3, pAE1/SpC Rep78; will be for transfection CSCI purified.  
 293 ΔRep78 AS cell line will be co-transfected with  
 BHG10 +  
 BHGE3 + pAE1 SpA/3.7 SpC Rep78 plasmids  
 ARE DNA





4/25/97

Kostya

- 1) I have got the virus 1101/1107 with gp19k mutated (restriction digestions and PCR).
- 2) Now preparing Hirt's from 4 plaques which should be 1101/1107 E1; Xba E3 deletion, ADP insert.
- 3) Failed to substitute T<sub>u</sub>S → ITR. Going to do it in 2 clonings but without partial digestions.
- 4) Sequencing shown that ITR is OK in Lynda's plasmid; could not sequence through ITR-ITR junction in p4610, 11; I have repeated the sequencing with different PCR protocol, now waiting for results.
- 5) I have checked with Ann, she doesn't have plasmids with rec 700 or pm 734.1 which would be suitable to cut out SrfI - NdeI fragment corresponding to whole E3, but she does have the viruses. Now going to prepare rec 700 and pm 734.1 DNA to insert SrfI - NdeI fragment to pCDNA3 / EcoRV site.
- 6) The virus 544 (1101/1107 E1; Lynda's deletion of E3 ~~(1101/1107 E1)~~, 12.5 k ATG mutated, d127984-28153 d128790-30883) + ADP insert into PaeI site in place of second deletion. → I gave the virus to Shari to grow up Cse prep.

Need TK gene from GTI.



Kerch 4/25/97

E3 proteins

- I have tested more NPGK 14.7 and R1D viruses. The ones that stain for p-Gal show some staining in IF for 14.7 or 14.5. The R1D (p) staining shows the same pattern as the previously made ~~Ad~~ Ad R1D viruses. In addition to this, the cells that stain are dead ~~from~~ (carryover from 293?). The 14.7 staining looks normal. I am growing up more of the positive clones.

-Fest project

- I have two transfections going in 293 Crn A.

Cancer Therapy project

- I have infected MCF-7 with 01/07, 975 and 308. Will do the same with A549 and 293 and take a growth curve.
- I am infecting W138 for the missing timepoints.
- I am titrating the remaining samples.

22-141 50 SHEETS  
22-142 100 SHEETS  
22-144 200 SHEETS

EXHIBIT

C37



1101/1107

175

300

A

G

A

G

A

G

D1  
D3  
D5  
D7  
D10  
D15  
D20  
D25  
D30

$< 10^5$   
 $2 \times 10^3$   
 $< 10^5$

$1 \times 10^5$   
 $5 \times 10^5$   
 $3 \times 10^5$   
 $4 \times 10^5$   
 $< 10^5$   
 $8 \times 10^5$   
 $2.3 \times 10^6$   
 $7 \times 10^5$

$1 \times 10^5$   
 $1.5 \times 10^5$   
 $1 \times 10^6$   
 $2 \times 10^5$   
 $8 \times 10^5$   
 $7 \times 10^5$

$4 \times 10^5$   
 $3 \times 10^5$   
 $1.4 \times 10^7$   
 $1 \times 10^6$   
 $1 \times 10^6$

$3 \times 10^6$   
 $1 \times 10^7$   
 $6 \times 10^7$   
 $2 \times 10^7$

$< 10^5$   
 $2 \times 10^7$   
 $4 \times 10^7$

22-141 50 SHEETS  
22-142 100 SHEETS  
22-144 200 SHEETS



EXHIBIT

C38

Sheet1 Chart 2

Approximate liters in W138 4/25/97

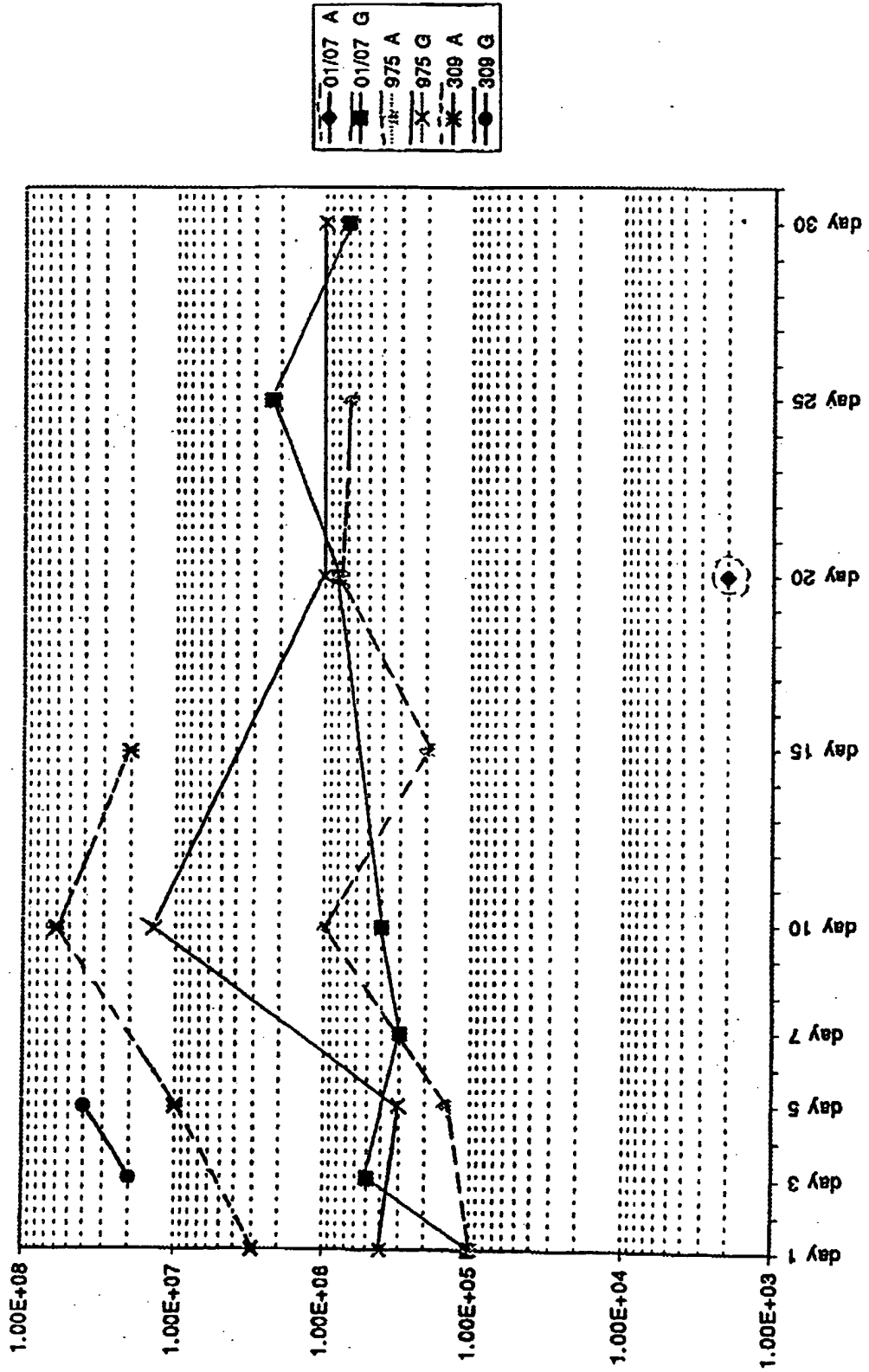


EXHIBIT  
C39

Nohan, 1/25/97

1. C.F. Project:

- a) cells showed CPE like effect (co-transfected pAE1SP1A/3.7SPC Rep78 and pBHG10) were titrated. No plaques yet 15<sup>th</sup> day. But when 293 cells infected with CPE, CPE like started look Ad CPE typical.
- b) In 293 Rep78 AS - cell line, co-transfections of pAE1SP1A/3.7SPC Rep78 and pBHG10 were done; pAE1SP1A/3.7SPC Rep78 and pBHG10E3 plasmids.
- c) Virus Ct 14.7 are growing in KB MMTV E1 Sp100 cells.
- d) GAPDH (Glyceraldehyde 3Phosphate dehydrogenase) primers - ordered.
- e) pBHG10, pBHG10E3 under preparation for further transfections.
- f) I am going to isolate d17001 DNA for transfection → Virus Rep78.

2. Cancer Project: HEL 299 cells

- Growing and Growth arrested cells are from for growth curve analysis.

EXHIBIT

C40

9/2/97 Kostya

- 1) Terry's gp19K plasmids. pCR11gp19K Ad5 turned out to be pCR11gp19K Ad2. pC13gp19K contains gp19K Ad2 in correct orientation. (Karol - Transfection - 1P).
- 2) Cloning of the complete E3 under CMV promoter:
  - i) There was E3 inton in Horowitz's virus, their construct starts ~200 bp after E3 transcription start in Ad2 E3.
  - ii) Started to extract rec 700 and pm 734.1 (m1m41) genomes to clone E3 to pCDNAB (or pC1?).
- 3) Cloning experiments to replace ITR in SP-B ↔ E4 promoter plasmid are in progress.
- 4) Got the virus 1101/1107 E1; <sup>grows much better than dl7001</sup> d(E3 X6a + ADP - checked with restriction digestion and PCR. Recently started experiment (plaque assay) to compare growth properties of 3 recombinants (Lynda's deletion E3 + ADP; <sup>KD1</sup> d1309 gp19K unmutated; <sup>KD2</sup> d(E3 X6a + ADP). Using <sup>KD3</sup> d1309; 1101/1107; pm 734.1 (m1m41); 7001 as controls. Cell lines - 293 and A549. Going to start with 1P to check for ADP expression. I'm really ready to put TK into 2 last recombinants E3, need TK plasmid and TK sequence from GT1. Need TK from GT5!

22-141 50 SHEETS  
22-142 100 SHEETS  
22-144 200 SHEETS



Kashy 5/2/87

ES proteinslacZ-PC-K-14 7k  
Molen got small  
band.

- I am growing up MP6k 14.7 #5 stained best IF.
- I did an IP with transfected p13k and 14.7 constructs (in 293 cells). All but pCBK3 14.7 expressed, all comparable to virus injection. (Labeling 38h post IF and 18h p.i. for 3h)
- I did an IF with the same transfections (in MCF7 cells) it did not work, I am repeating it.

Fas L project

- I am waiting for plaques in 293-Crnt cells.  
Have one plaque after 10 days.

Cancer Therapy project

I have infected	MCF7	01/07 500 ph	975 100 ph	309 100 ph
	A548	500 ph	500 ph	500 ph
	293	500 ph	100 ph	100 ph

293 is rounded up 1 day p.i.  
A548 2 days p.i.  
MCF7 5 days p.i.

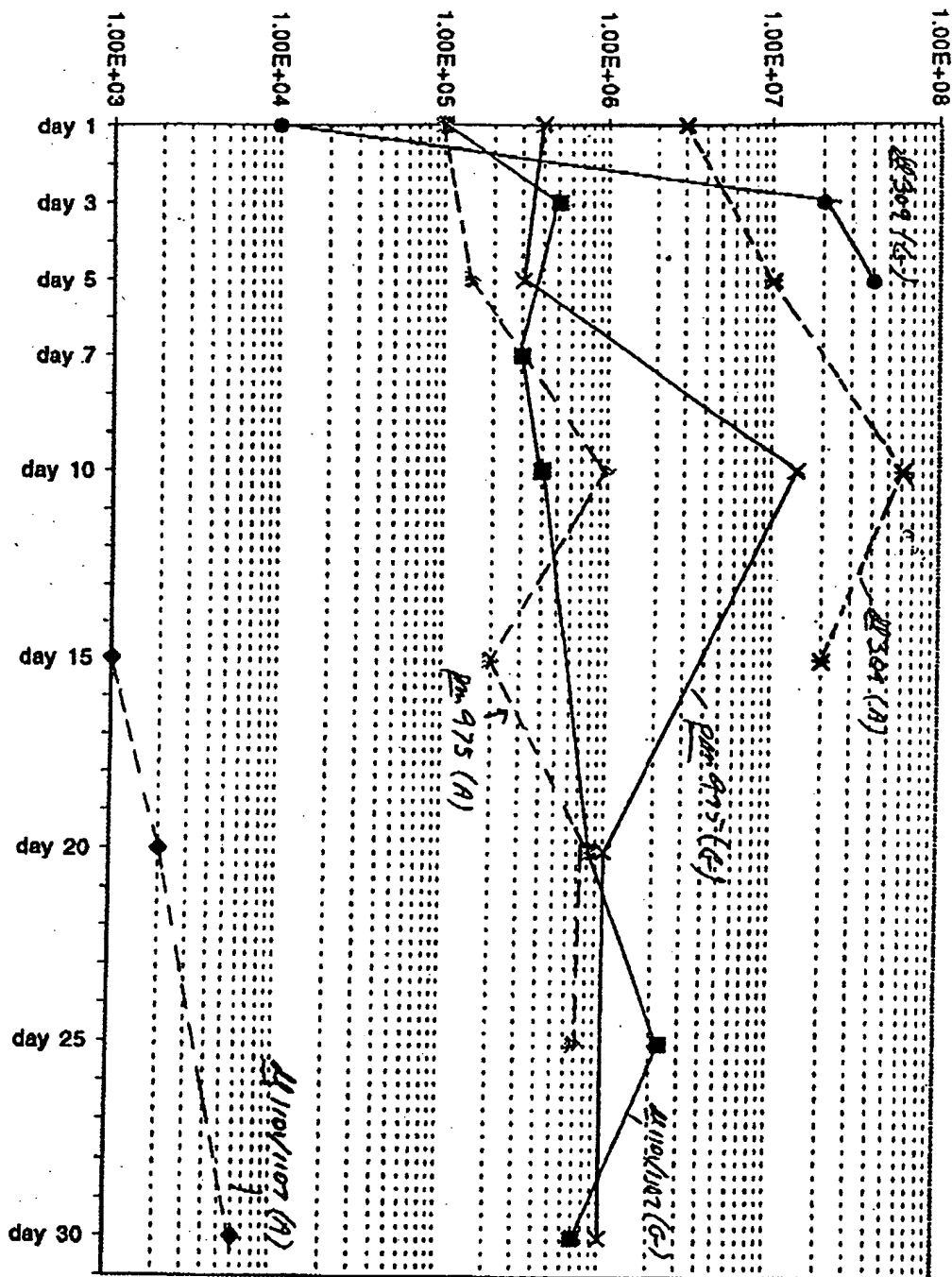
22-141 50 SHEETS  
22-142 100 SHEETS  
22-144 200 SHEETS



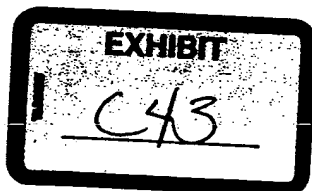
EXHIBIT

C42

Approximate titers in W138



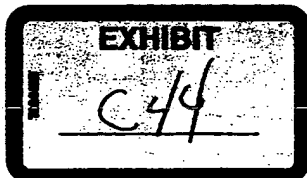
—◆—	01/07 A
—■—	01/07 G
—△—	975 A
—×—	975 G
—●—	308 A
—○—	308 G



5/2/97 Kostya

- 1) Terry's gp19K plasmids. pCR11gp19K Ad5 turned out to be pCR11gp19K Ad2. pC13gp19K contains gp19K Ad2 in correct orientation. (Karol - Transfection - IP).
- 2) Cloning of the complete E3 under CMV promoter:
  - i) There was E3 inton in Horowitz's virus, their construct starts ~200 bp after E3 transcription start in Ad2 E3.
  - ii) Started to extract Rec 700 and pm 734.1 (m1m41, genomes to clone E3 to pCDNAB (or pC1?).
- 3) Cloning experiments to replace ITR in SP-B ↔ E4 promoter plasmid are in progress.
- 4) Got the virus 1101/1107 E1; <sup>grows much better than dl7001</sup> dlE3 X6a + ADP. Checked with restriction digestion and PCR. Recently started experiment (plaque assay) to compare growth properties of 3 recombinants (Lynda's deletion E3 + ADP; dl309 gp19K unmutated; dlE3 X6a + ADP). Using dl309; 1101/1107; pm 734.1 (m1m41); 7001 as controls. Cell lines - 293 and ASE9. Going to start with IP to check for ADP expression. I'm really ready to put TK into 2 last recombinants E3, need TK plasmid and TK sequence from GT1.  
Need TK from GT1!

22-141 50 SHEETS  
22-142 100 SHEETS  
22-144 200 SHEETS



1. C.F. Project:

- a) BMCE3 172 LacZ virus gave moderate band in CSCI banding. But the  $\beta$  gal activity/ml is  $\sim 1.4 \times 10^9$  which is same as previous 172 LacZ preparation. Second set is being titrated to compare the pfu/Lfu/ml.

[ I may use Centricon 100 (M.Wt cut off 100,000) to concentrate the viral stocks for one CSCI spinning which will increase the pfu. Dialysis of stock 172 LacZ virus will increase the volume and it is hard to spin in one tube.

- b) Co-transfection of pESp1A/32 SEC Rep78 & pB2610; pBCE3 in 293 Rep78 antisense cell line will be stained next week.

2. E3 project:

- a) Virus CT 14.7 (pGKII 14.7 + p gal) gave moderate band in CSCI spinning. Viral titrations are in progress.

- b) Going to make another virus 14.7 LacZ (pGK 14.7 in E3; LacZ in E1) preparation. - infection today

3. Cancer Project:

Growing and growth arrested virus infected HEL 293 cells ~~extract~~ extract will be titrated for growth curve next week.

1101/1107 at 500 PFU/cell  
1109 " " "

EXHIBIT

C45



Sheet1 Chart 3

Growth curve 3

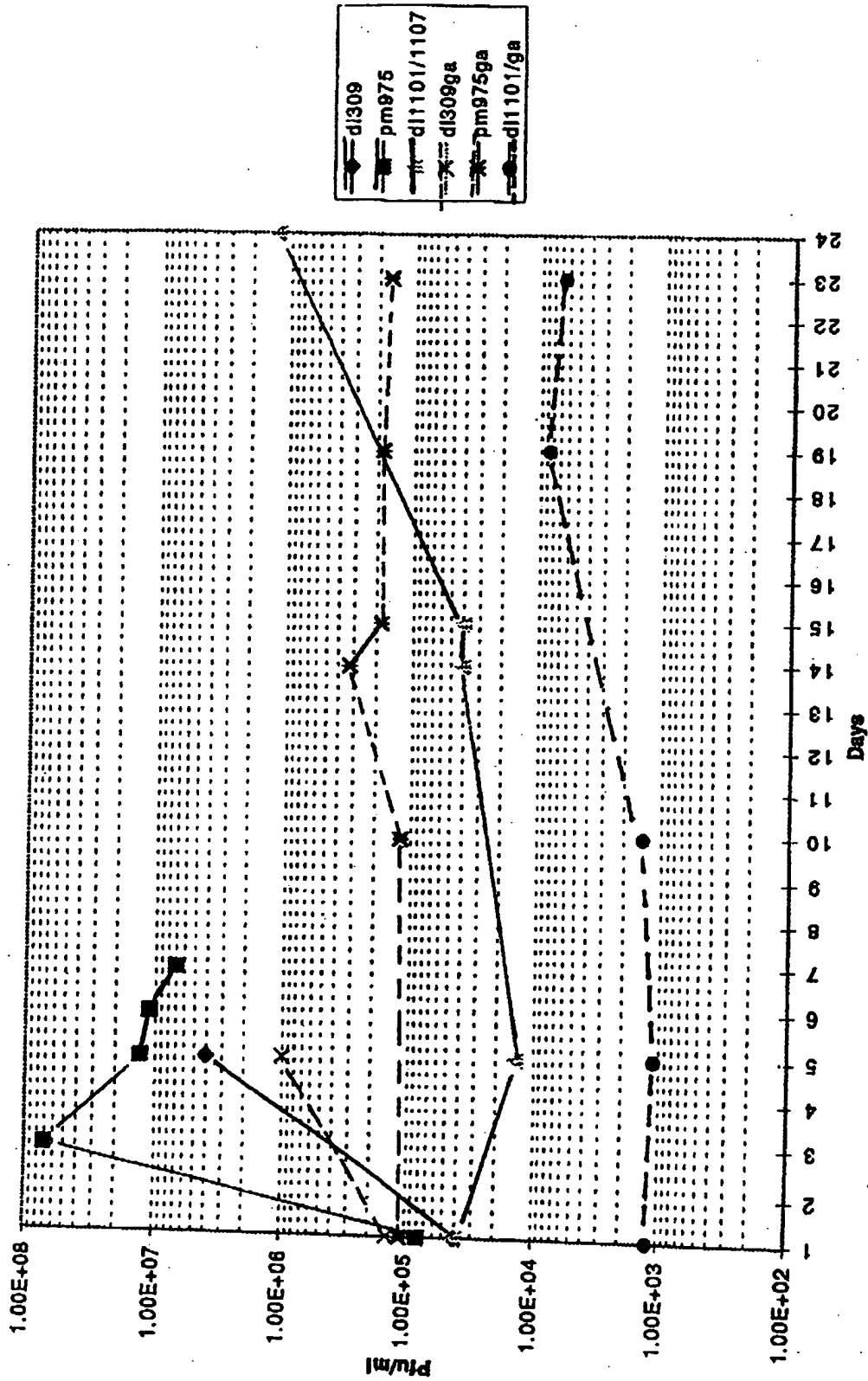


EXHIBIT  
C46

Kostya

i) Results of cotransfection 1101/1107 1EcoRI + p54 (dE3 + ADP) → 4 more plaques were analyzed. 3 of them contain recombinant genomes.

ii) Subcloning of dE309 E3 with gp19K mutated and dE3 Xba + ADP into Linde's plasmid is in progress. When the plasmid with 19K\* is made I'm going to insert HSV-1 TK into PacI site created in gp19K gene.

i) No plaques with pC2B (pBAG11 E4 promoter → CMV promoter). No plaques with pBAG11 as a control.

ii) 4 more plaques resulting 1101/1107 1EcoRI + p82 (E4 → SP-B promoter) were analyzed. All contain wt genomes.

iii) In 2 repetitions of cotransfection 1101/1107 with p82 (E4 → SP-B promoter) no plaques neither in control no in experiment. 2nd experiment was done on Moken's 293/CMV-TTF cells.

Now repeating the cotransfection.

iv) Sequencing of Nipper's plasmid p21 (E4 promoter dE) is in progress to prove that right Ad ITR is intact in the plasmid.

i) Growing initial stocks of the recombinant virus with dE3 + ADP.



Gene Therapy Group

Koroly 5/8/97

E3 proteins

- I am growing up MP6K 14.7 #5
- I did an IF with transfected gp13k and 14.7 constructs in MCF7 cells, all of them but pCDNA3 14.7 expressed well.

Virus - MP6K gp13k and pGlu 14.7 were negative after 20h.  
Nelson is doing a longer infection assay

Fast project

- I have 4 plaques. They appeared <sup>slow plaques at</sup> 10-11 days after transfection with BHK in 293 crm A cells. Will pick one plaque (large) today.

Cancer Parag project.

293, MCF7, lost time missed: multiple  
Repeat: 293, MCF7, lost time missed: multiple

I am repeating A548 infections and some U138 infections.

CPE in U138 cells

A = 0.2% serum FCS  
G = 5% FCS

01/07 A

no CPE

01/07 G

"atypical CPE"  
starting around  
day 10

No CPE in 1101/1107, either in

500 pfu

The "growing" don't  
really grow.

growing or  
non-growing.  
But, have fewer cells  
in the growing than  
non-growing

975 G

02 +/-

03 X

04 +

05 ++

06 +++

308 G

03 +/-

04 +

05 ++

06 +++

No real

diff. between

G and A

for p975

500 PFU

975 A

04 +/-

05 +

06 ++

07 +++

308 A

05 +

06 +

07 +

500 pfu

For 100 PFU, growing was same as 500 PFU  
But, arrested did not show CPE  
until ~15 day. Same in HEL-299.

100 pfu

also p.c.f.

By pCDNA3.1. Clone gp19, 14.7, RLD

① M12-14.7 M12-14.7

EXHIBIT

C48

2 photograph  
as done with  
0 p.p.m.

lost labels  
12 plaques  
A - CAT is lost in  
free ERF  
38, 112-299

missing recap  
# cells 11/11/97

5/9/97 Kostya

- 1) Construction of the plasmids with whole E3 (rec 700, pm 734.1) is in progress.
- 2) I have constructed the plasmid with E4 $\leftrightarrow$ SP-8 where T<sub>u</sub>S  $\leftrightarrow$  ITR, sequenced the plasmid, now waiting for sequencing results to make the large version of the plasmid for cotransfection.
- 3) For 101-1 (dl 3.4 E3, gp 19K untested) plaques are appearing the same day as for 309 (day 4).  
For 111-1 (E3 Xba dl + ADP) plaques appeared 1 day before dl 309. (day 3)

① KD-1. 1101/1107 in Lynda's E3 background + ADP.  
No promoter for ADP.

Shari harvested day 2 pi, got band, will titer.  
Cells were beginning to die. Shari will titer.

② KD-2 1101/1107, 309 E3, gp 19K untested.  
Plaques appearing same day as 309.

③ KD-3 1101/1107, XbaI deletion (dl 327 deletion),  
ADP without promoter, but in-frame is 6.7K.  
Got plaques 1 day before dl 309 (ix on day 3).  
Got this <sup>one</sup> plaque 4 days posttransfection, 5mm wide.  
Got other 3 plaques 7 days posttransfect  
DNA screened - are recombinant.

Future - could put ADP under control of SPB promoter.  
First, concentrate on what we have.

mutant ADP with 20.3 ...



Mohan, 5/9/97

1. C.F. Project:

- a) Virus BM6 E3 ITR LacZ gene  $1.4 \times 10^9$  lpfu/ml preplanning  
 Plaque assay gave  $9 \times 10^8$  pfu/ml (1st day)

I received Centricon 50 concentrator from Millipore as  
 samples - going to concentrate the ITR LacZ virus.

- b) So far no plaques for constructing Rep78 virus.

- c) GAPDH - RT-PCR in progress.

- d) Going to G-tranfect di700 DNA that digested, with  
 pSPC Rep78 plasmid.

2. E3 project:

Particular conversion, left-to-right orientation

- a) Virus C+14.7 (p~~SPC~~ <sup>Pol II</sup> 14.7 + p<sub>gluc</sub>) has been  
 Titrated. No plaques yet - 1st day.

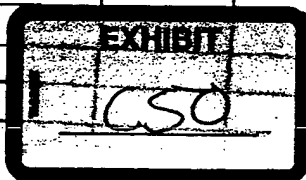
- b) CPE stock for 14.7 LacZ (p~~SPC~~ <sup>Pol II</sup> 14.7 + LacZ) virus  
 has been made. Going to titrate (5ml final)

- c) A549 cells are infected  $\approx$  1700, GP19K and  
 C+14.7 virus for I.F. (2 days & 4 days)  
 Hard 2 days - negative already infected.

3. Cancer project:- HEL 293 cells

Growing, growth arrested, 11/01/07 (5000)  
 infected - CPE stocks are Titrated for growth curve  
 Will do 3rd in coming week

HEL-293 100, 500 PFU Graph: days p.i. vs CPE - will give me.



5/23/97 Kostya

1) E3 project

Cloning of E3 from rec 700 and pm 754.1  
in pBSSK (+) - got bacterial colonies, enzyming  
then reclone into pCE, then make virus.

2) Cancer therapy project

- i) Made a large plasmid (Bam → end of genome)  
with E4 → SRB promoter and ITR repaired,  
now making Cacc prep. of the plasmid to transfect.

Next week make virus

- ii) Plaque development assay for E3 ADP viruses:

a) 293 cells (day 18)

Negative control:

7001 - plaques just started to appear (day 18).

734.1 - plaques appeared day 14-15

Positive control:

309 - day 4-5

1101/1107 - day 4-5

Recombinant viruses:

KD1 (544, LKH d1 E3 + ADP) - day 5-6, plaques smaller than wt.

KD2 (101-1, d1309, gp 19K \*) - day 4-5, large plaques.

KD3 (111-1, d1327 + ADP) - day 4-5, large plaques.

b) A549 cells (day 8)

Same day a little faster than wt  
Perhaps a little larger.

309 - day 4-5 (large)

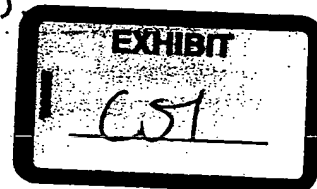
1101/1107 - day 8 (small)

734.1; 7001 - no plaques yet.

KD1 - didn't make

KD2 - day 5-6, large, smaller than wt (309)

KD3 - day 5-6, smaller than KD2.



Mohan, 5/23/97

1 C.F. Project:

- a) VIRUS BHGE31TR LACZ was concentrated using Centricon filter columns. Lfu is  $\sim 3.86 \times 10^{10}$  /ml (Lml)
- b) d1700<sup>+</sup> viral DNA digested with ClaI and pAE1split/Splapi were co-transfected.
- c) 293 TFE cell lines were transfected with pAE1/Splapi. I.F. stained for Rep78. Most of cells transfected with pAE1/Splapi Rep78 are washed out. Few cells (about 2) showed nuclear staining. But not clear.
- d) 293 L Rep78 antisense cell lines showed GAPDH-PCR fragment not the Rep78 fragment. So, no AAIV2 contamination.

2 E3 Project:

- a) NPGK LACZ 14.7 (CPE STAIN) gene =  $3 \times 10^8$  Lfu/ml in 293 cells but in A549 =  $2.3 \times 10^{10}$  Lfu/ml  $\sim 10$  fold more in A549 cells than 293 cells

- b) I.F. = A549 cells: + TPO - 21 hrs (21 hrs) for 14.7  
 $\sim 50$  pfu/cell NPGK 14.7 - 1 day -  
 2 day -  
 4 day + + + +  
 (Bacteriophage 14.7) - 4 day + + (cytoplasmic staining)  
 GP19K = Background +

VIRUSES NPGK 14.7 expresses 14.7 or 4 days post infection at wt. level.

Ct 14.7, at 4th day expresses lesser. Mainly cytoplasmic staining and around the nucleus.

Ct 14.7 when titrated  $-10^7, 10^8, 10^9$  no plaques. - Titer may be less. So, -IF- may be less.

EXHIBIT

CS2

3 Cancer project: HZL 299 cells 500 pfu/cell

Growing

d1309 d140/07

3 hrs	$9 \times 10^3$	$2 \times 10^4$
1 day	$1 \times 10^4$	$4.2 \times 10^4$
4 "	$1.6 \times 10^4$	$1.2 \times 10^5$
6 "	$2.3 \times 10^4$	
8 "	$9 \times 10^4$	$1.4 \times 10^5$
10 "		$7.1 \times 10^5$
15 "		$2.2 \times 10^6$
21 "		$4.6 \times 10^6$

Growth arrested

3 hrs	$4 \times 10^4$
1 day	$4.4 \times 10^4$
4 "	$4 \times 10^4$
8 "	$5 \times 10^4$
10 "	$1 \times 10^4$
15 "	$1 \times 10^4$
21 "	$2 \times 10^4$

EXHIBIT

655



Handy 5/23/97

ES proteins

- I am doing an IP with NPGK K<sub>7</sub> and Ct K<sub>7</sub>
- I am growing up lac-Pol II p19K
- I am cloning the MTZ expression cassette in pC12Pac (Lynda changed the BamHI and BspII sites to PaeI in pC1)

Fos L project

- I have isolated 4 plaques. <sup>Could be WT.</sup> They grow very fast (kill 293 ON, show CPE in A549 ON).
- I have infected MCF7 and MCF7crmA cells, it shows CPE ON in both.
- I have tried to PCR out Fos L from the virus, it failed. Positive control (plasmid) was OK.
- The virus expresses  $\beta$ -gal
- I am trying to show the protein in IF.

Cancer therapy project

- I am going to test yields from A549, MCF-7 and 293 next week.

50 SHEETS  
100 SHEETS  
200 SHEETS22-141  
22-142  
22-144

EXHIBIT

C54

5/30/97 Kostya

1) E3 project :

Made the plasmid with E3 from pm 739.1 (u1u41).  
(ADP<sup>-</sup>) - Sfi1-Xba1 fragment in pBlueScript. Now cloning  
is in progress to put it into pCDNA3.2eo(+)-new  
plasmid with CMV promoter. Now just started.

2) Cancer therapy project :

i) Made cotransfection of 1101/1107 / EcoRI with p152<sup>SPB</sup>  
(new version of large plasmid Ban - Ecd with  
SPB  $\leftrightarrow$  E4 promoter substitution). to 293 and promote  
293-TTC cells, cotransfected pCMV/TTC  $\leftrightarrow$  well. Has ITR  
(made by Mohan)

ii) Plaque development assay for E3 ADP viruses :

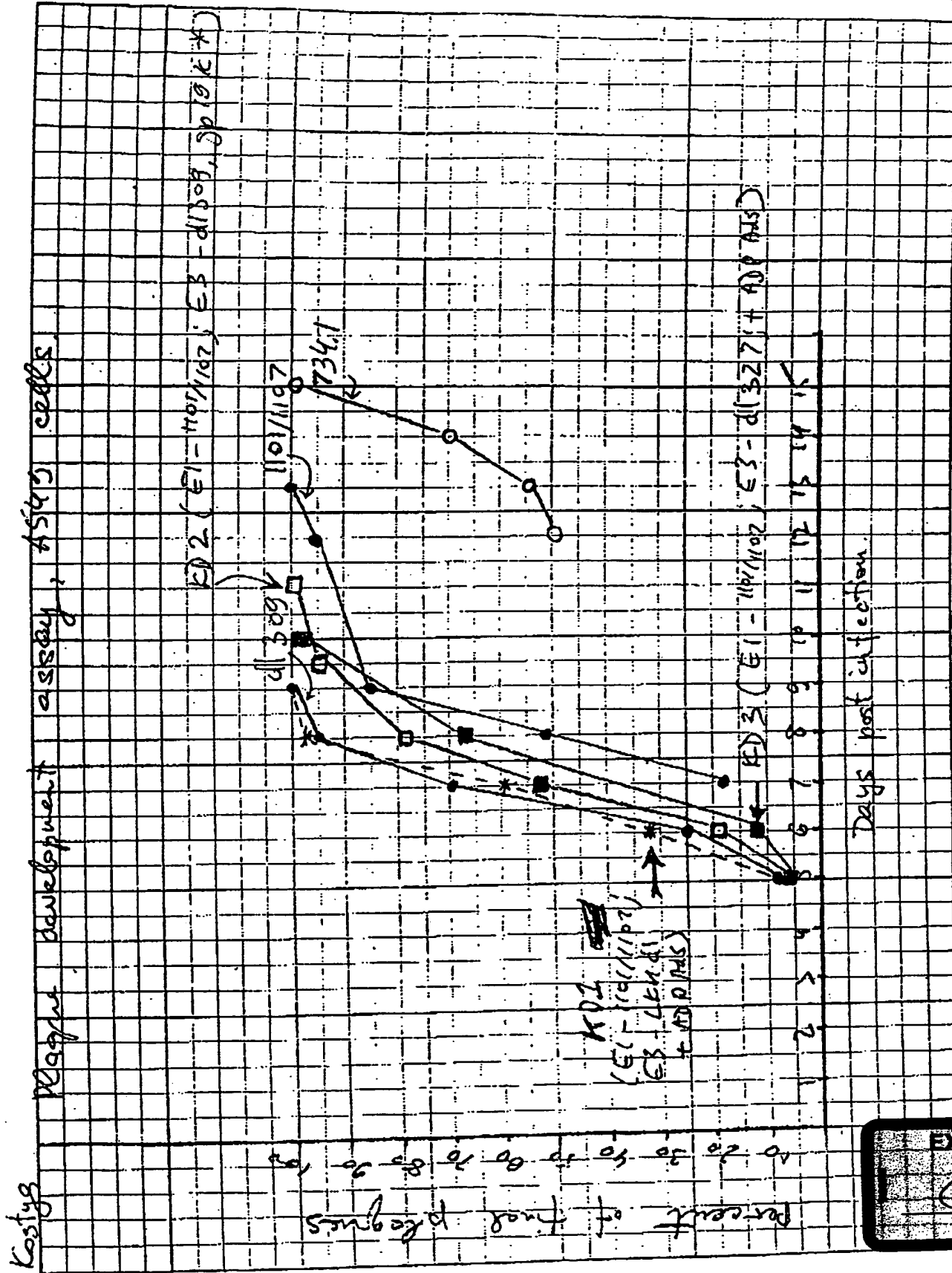
293 cells - see graph.

AS49 cells - in progress.

iii) Starting IP with AS ADP sera to check for  
ADP expression in the viruses direct.

22-141 50 SHEETS  
22-142 100 SHEETS  
22-144 200 SHEETS





Korody 5/30/97

E3 protein

- I did an IP with NPGK 147B, the result is not conclusive.
- I am repeating the MTZ cloning.

Fool project

- The tested four plaques were not expressing  $\beta$ -Gal. I found two blue cells, I don't know where they came from.
- I have 3 new plaques, they came at the same time as lacZ controls.

Crm A

I am cloning CMV-CrmA in the left end plasmid

Cancer Therapy

- I am titrating the time course in A549, MCF-7 and 283 cells. Started yesterday.

E2-Gal

I am waiting for plaques  
No plaques on lacZ control yet either.

In Chip's GAL1-TAD 283 cell line

(24 and 8 days).

BH611, E2A promoter substituted  
c Gal4/TATA.

lip- give Ad2 x Ad5 combo. in pCI, to Karl. Make Ad vector  $\pm$  lacZ

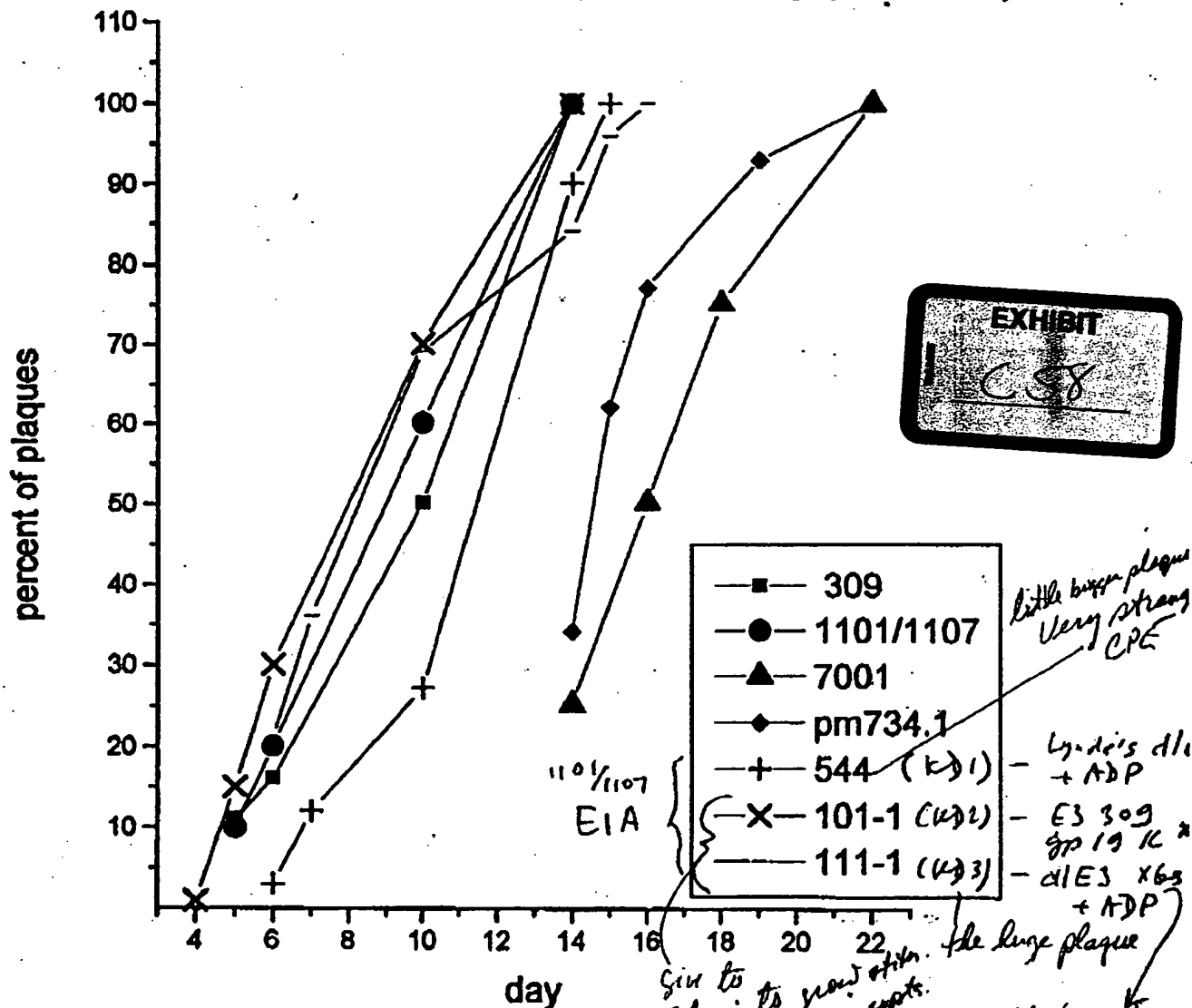
- give R572TR-14.7K, pCI-14.7K, pMT2-14.7K to Mula. Make Ad vector  $\pm$  lacZ

Wye - will handle 9P19K/CMV, Ad2 version.

EXHIBIT

C57

## Plaque development assay (293 cells)



Make one 7 KD1,2,3  
also lacking E1B-19K.

A5219 exp1 - now at 14 days. Look like 293, but 309 is a bit faster.  
 so 1101/1107 mutant does slow plaques a little.

Mohau 5/30/97

1. C.F. Project:

- a) 293 cells (< Rep 78), transfected by dl 7001 DNA ( $2^{14}$ ) started showing plaques (~40/60mm dish) ~ 15 days  
 cells co-transfected with pAE1 Sp1A/3.7 SPC Rep78 and dl 7001 + ClaI digested viral DNA  
 no plaques yet. (15th day)  
 cells transfected by dl 7001 + ClaI - no plaques -

(I am going to several transfections using dl 7001 + ClaI digested DNA)

- b) MCF-7 ~~cells~~ cells were transfected - as following -  
 plasmids for I.F. for Rep78  
 1) pCDNA3 Rep78 (IF will show Rep78 expression)  
 2) pCMV TTF  
 3) pCMV TTF + pAE1 Sp1A/3.7 SPC Rep78  
 4) pAE1 Sp1A/3.7 SPC

- c) Primers for Rep78 antisense → ordered.

2. E3 project:

- a) viruses Ct14.7 (Pactra promoter), 14.7 LacZ  
 (p01 2 14.7)  
 did not show plaques at  $10^{-7}$  dilution.

particles/OP; for wt Ad  $9.04 \times 10^{13}$  /ml - STD.

		1	2	pfu	partic./OP = OP8
Ccl	r700	0.174	0.167	$9.88 \times 10^{10}$	$\sim 1.54 \times 10^{12}$
	Ct14.7	0.232	0.217	~	$\sim 1.9 \times 10^{12}$
CPE 90% - APGK 14.7		0.869	0.861	$3 \times 10^8$ 293 $2.3 \times 10^9$ 14.7	---
(medium is interfering)					

— Going to repeat with more dilutions.

- b) After Ct14.7 and 14.7 LacZ pfu → I.F.

EXHIBIT

1 C59

3. Cancer project: HEL 299 cells; 500 pfu/cell

dl309 growth arrested cells → stained  
→ plaques start appearing. Count ~ 2 day

EXHIBIT

C60

Sheet1 Chart 6

Growth curve 500 pfu/cell  
(HEL 299 cells)

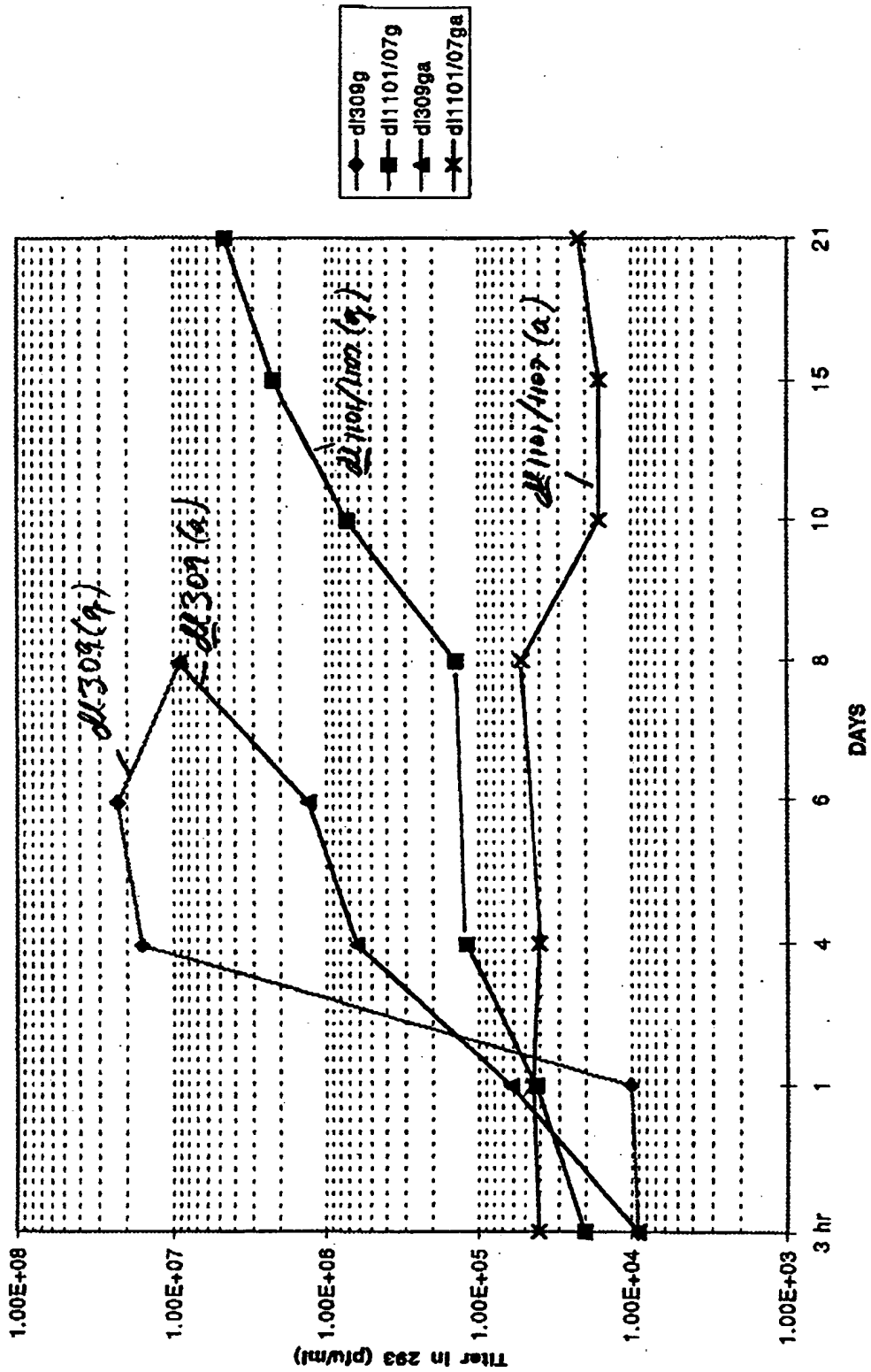


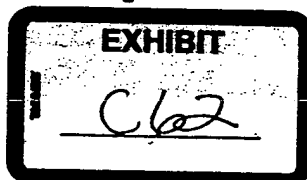
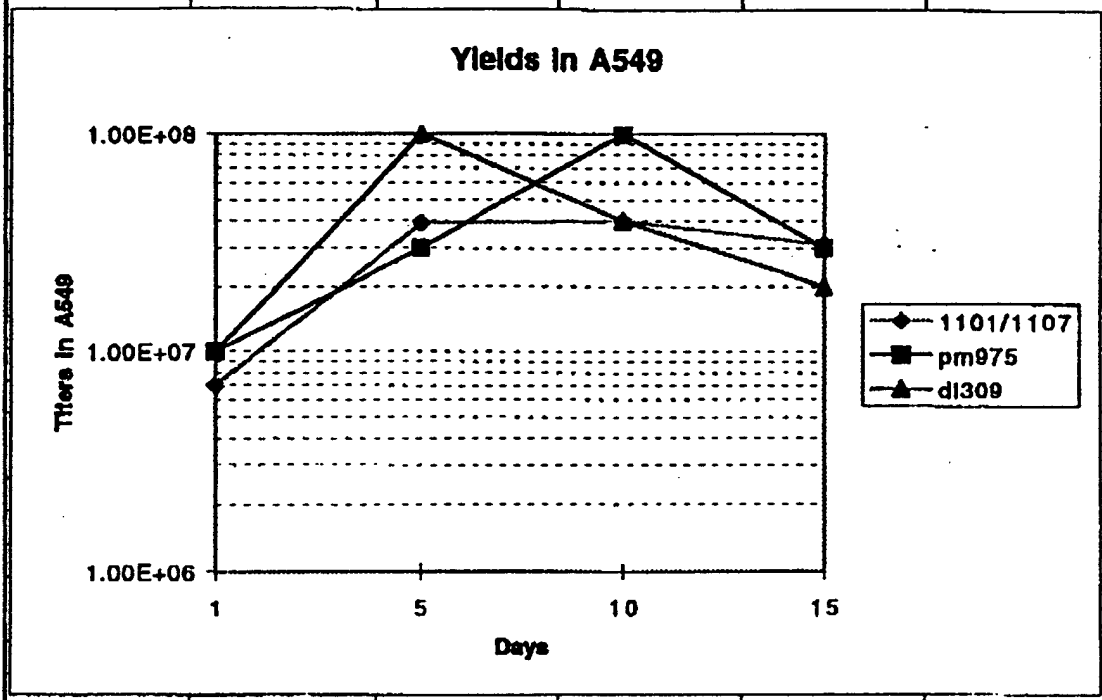
EXHIBIT  
C61

Figure 1.

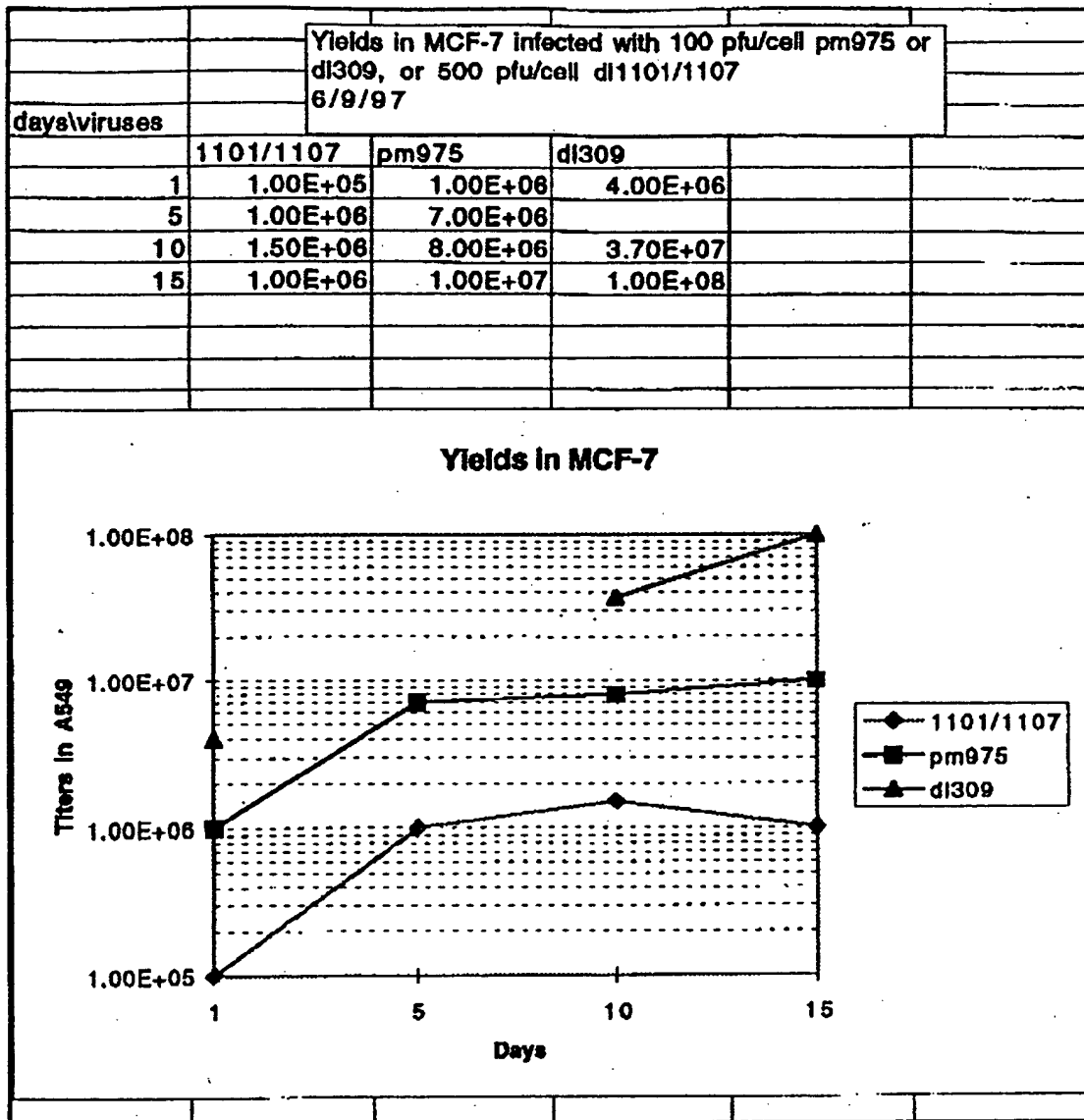


## Sheet1

Yields in A549 infected with 100 pfu/cell pm975 or dl309, or 500 pfu/cell dl1101/1107 6/9/97			
days/viruses	1101/1107	pm975	dl309
1	7.00E+08	1.00E+07	1.00E+07
5	3.90E+07	3.00E+07	1.00E+08
10	4.00E+07	1.00E+08	4.00E+07
15	3.10E+07	3.00E+07	2.00E+07

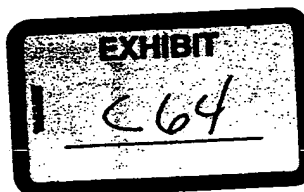
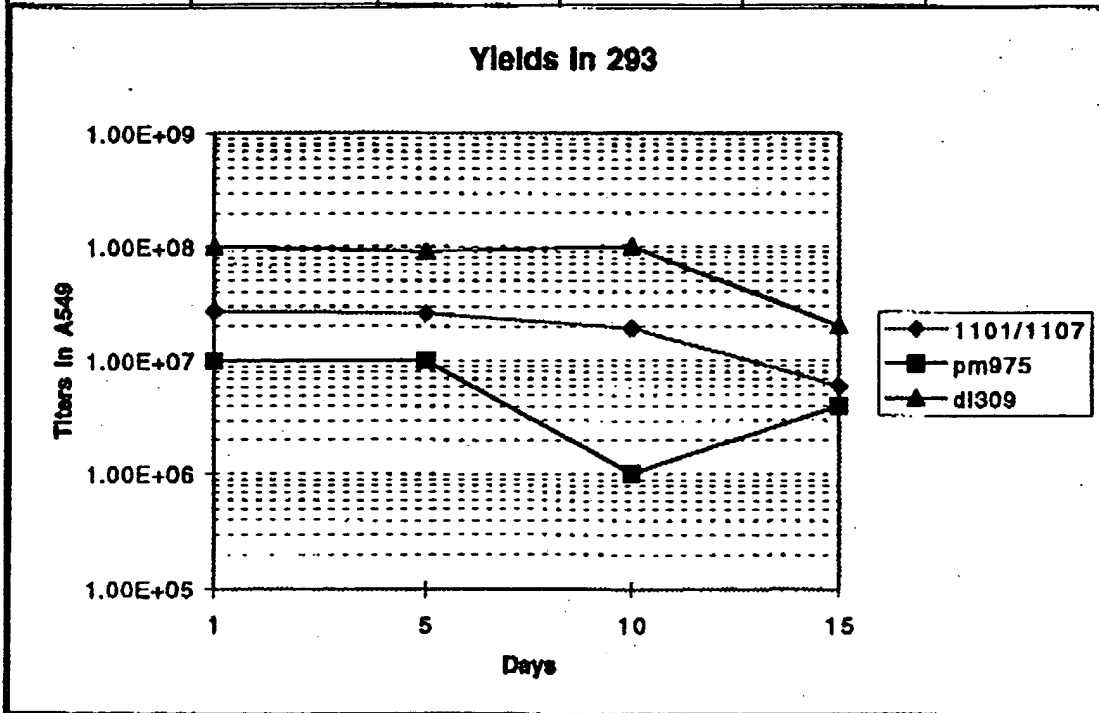


## Sheet1



## Sheet1

Yields in 293 infected with 100 pfu/cell pm975 or dl309, or 500 pfu/cell dl1101/1107 6/9/97				
days\viruses	1101/1107	pm975	dl309	
1	2.70E+07	1.00E+07	1.00E+08	
5	2.80E+07	1.00E+07	9.00E+07	
10	1.90E+07	1.00E+06	1.00E+08	
15	6.00E+06	4.00E+06	2.00E+07	



6/13/97 NOS'yr

1) E3 project

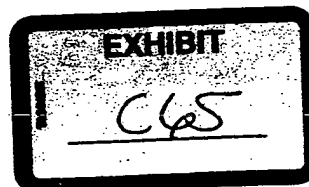
Made the plasmid with E3 (SrfI-NdeI) from pm754.1 (ADP-) in pCDNA3.1zeo(+). Gave maxiprep to Karol to check for E3 proteins.

2) Cancer therapy project

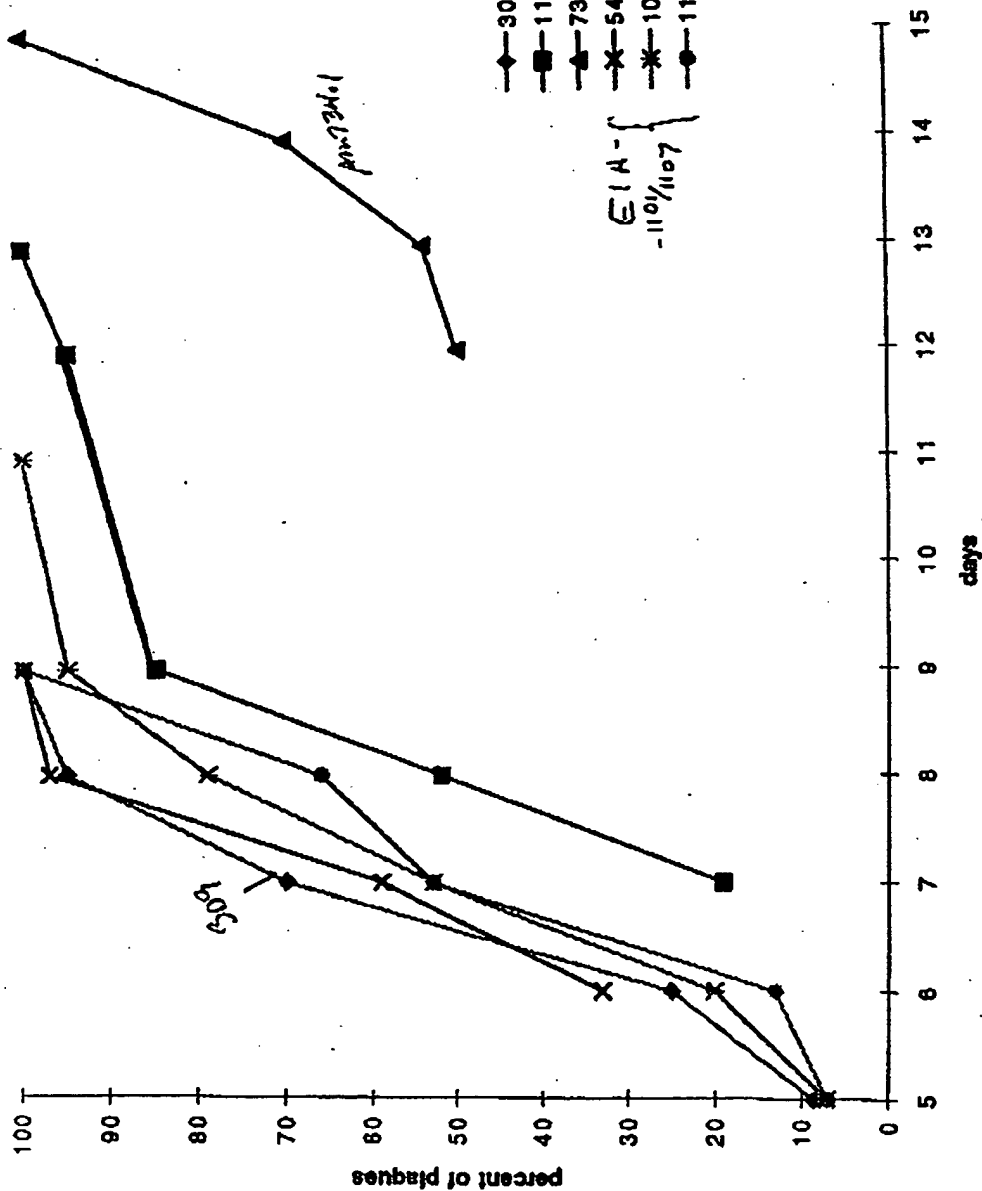
i) There are no plaques yet in dishes with p152 (G4SPB) transfection (2 weeks).

ii) Plaque development assay for E3 ADP viruses in A549 - see graph.

iii) IP with anti-ADP serum didn't work (even in positive control). Next week going to try IP with controls and various sera to optimize experiment conditions.



Plaque development assay, A549



309  
 1101/1107  
 734.1  
 544 - KD1 (Lynda's d1 E3 + ADP)  
 101-1 - KD2 (E3 309, SP 19 E 4)  
 111-1 - KD3 (d1 E3 327 + ADP)

EXHIBIT  
C66

Mohan, 6/13/97

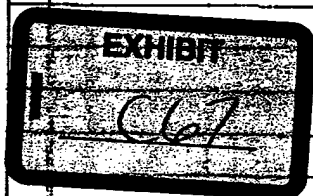
1. C.F. project

- a) 293 cells expressing anti. by p2E1Sp1A/3.7 sp Rep78 a viral DNA - shows the flow.
- b) 293 < Rep78 cell lines sho. fragment by PCR.

2. E3 project:

a)

Particles/OD, OPU



	OPU <sup>1</sup>	OPU <sup>2</sup>	Pfu
r700	$1.52 \times 10^{12}$	$9.5 \times 10^{11}$	$9.88 \times 10^{10}$
C+14.7	$1.9 \times 10^{12}$	$9 \times 10^{11}$	
GP19K	-	$2.8 \times 10^{11}$	$1.2 \times 10^9$
ITR LacZ	-	$2.2 \times 10^{12}$	$9.8 \times 10^{10}$

PFU will be  $\sim 10^7$  reproducible

- b) LSC purified r700, C+14.7, and GP19K virus - 100  $\mu$ l  $\rightarrow$  viral DNA  $\rightarrow$  gel.

It seems from the gel, OPU/DNA ratio looks reasonable. ~~OK~~

If it is true then virus prepn - does it have more defective particles in C+14.7, or toxic?

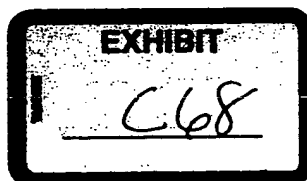
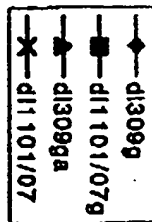
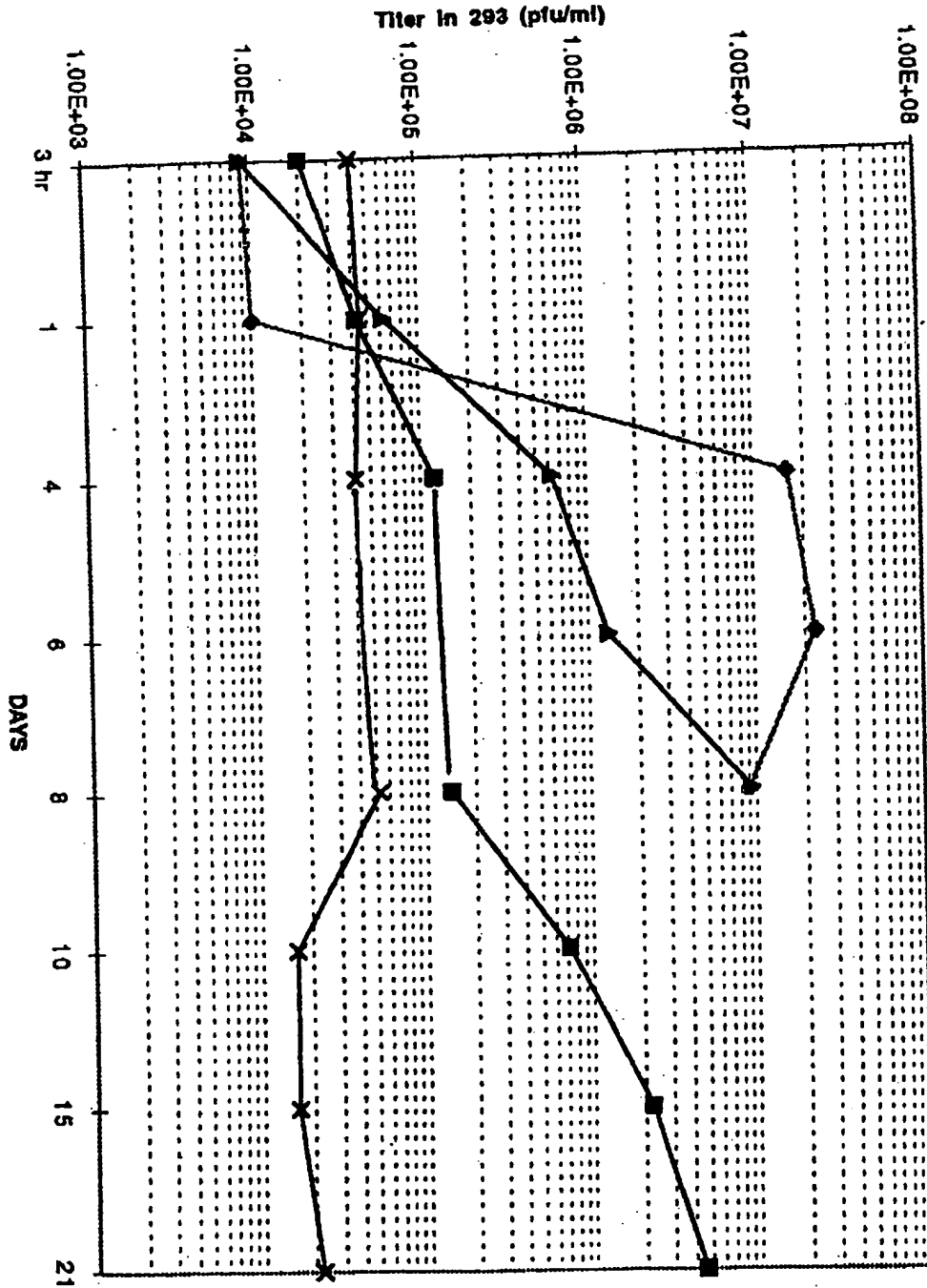
- c) I.F. A549 cells, r700, NP6K 14.7 and GP19K (50 p.p.m.) < 14.7.

- d) Transferring GP19K fragment from pCI19K to left hand plasmid p2E1Sp1A and p#30 (p2E1Sp1A/VA11) #30 NP6K  $\rightarrow$  pCI. Have clone p2E1Sp1A. AT (LacZ opposite end). I have a clone in p2E1Sp1A  $\rightarrow$  plasmid prepn  $\rightarrow$  I have clones in p#30 vectors  $\rightarrow$  analyzing. NP1, NP2, LacZ

3. Cancer project: HEC 293 cells, dl309 and dl1101/1207 (50 p.p.m.) See growth curve graph

## Sheet Chart 6

## Growth curve 500 pfu/cell



LONDON 6/12/02

E3 proteins

- I did a Western with Ct 14.7 and VP6K147B
- I am doing an IF with Kostya's CMV E3 and Todor's 760 R10
- I have a problem with cloning, I am working on it.

FasL project

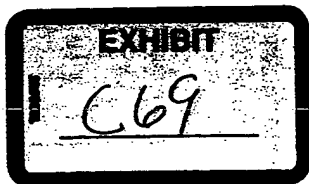
- I have ~ 15 new plaques, they came at about the same time as lacZ. I am growing them up.

Cancer therapy

- Time course in 293, A549 and MCF 7 is done, I am making 0 hour timepoints.

E2-Gal

- No plaques yet (not even in control).

22-141 50 SHEETS  
22-142 100 SHEETS  
22-144 200 SHEETS22-141  
22-142  
22-144



Kostya 6/11/97

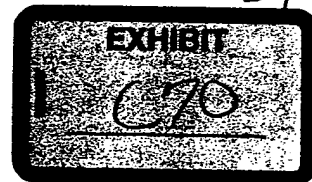
# 1) E3 project.

734.1 ← ~~lucZ~~

i) Have made the left-hand plasmid based on p#30 (pΔE1sp + lacZ-RSV) with CMV-E3 pm 734.1 expression cassette in it. Now making cell prep. to check for expression and making virus.

ii) Failed to clone same CMV-E3 pm 734.1 into plasmid with Lynda's E3 deletion. Going to reclone CMV-E3 pm 734.1 into pCI 2xPc (Lynda), then I'll be able to put the expression cassette to Pci site of either Lynda's plasmid or pBK611.

iii) Karol has shown that Terry's PC1/14.7 either don't express or express weak. I'm going to clone 14.7 from pMT2/14.7 to pCDNA3.1Zeo(+), then CMV-14.7 to p#30.



# 2) Cancer therapy project.

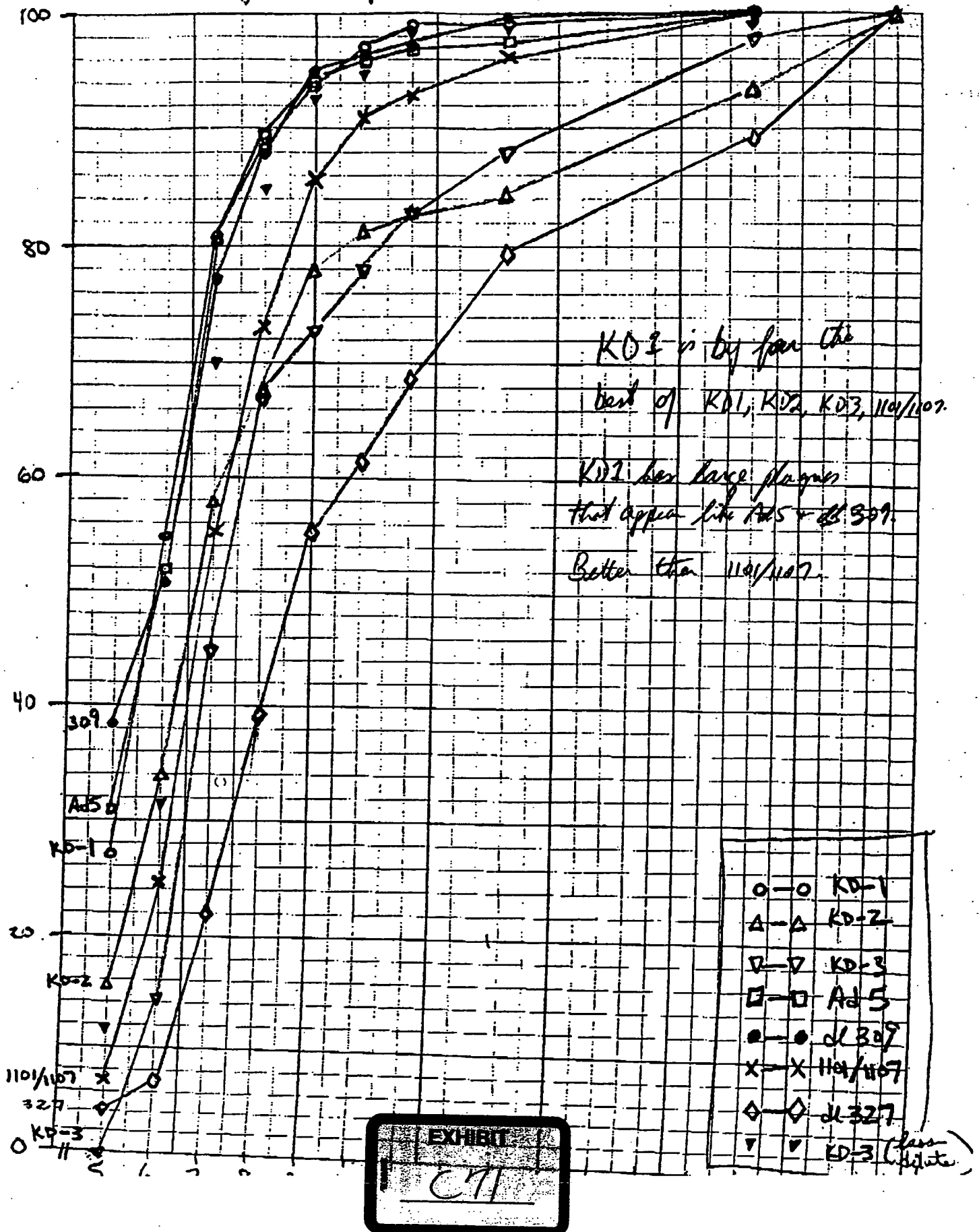
i) Got 293/E4 from Valery Krongliak. Now growing them up to freeze and to repeat transfection experiments with SP-B ↔ E4 promoter substitution.

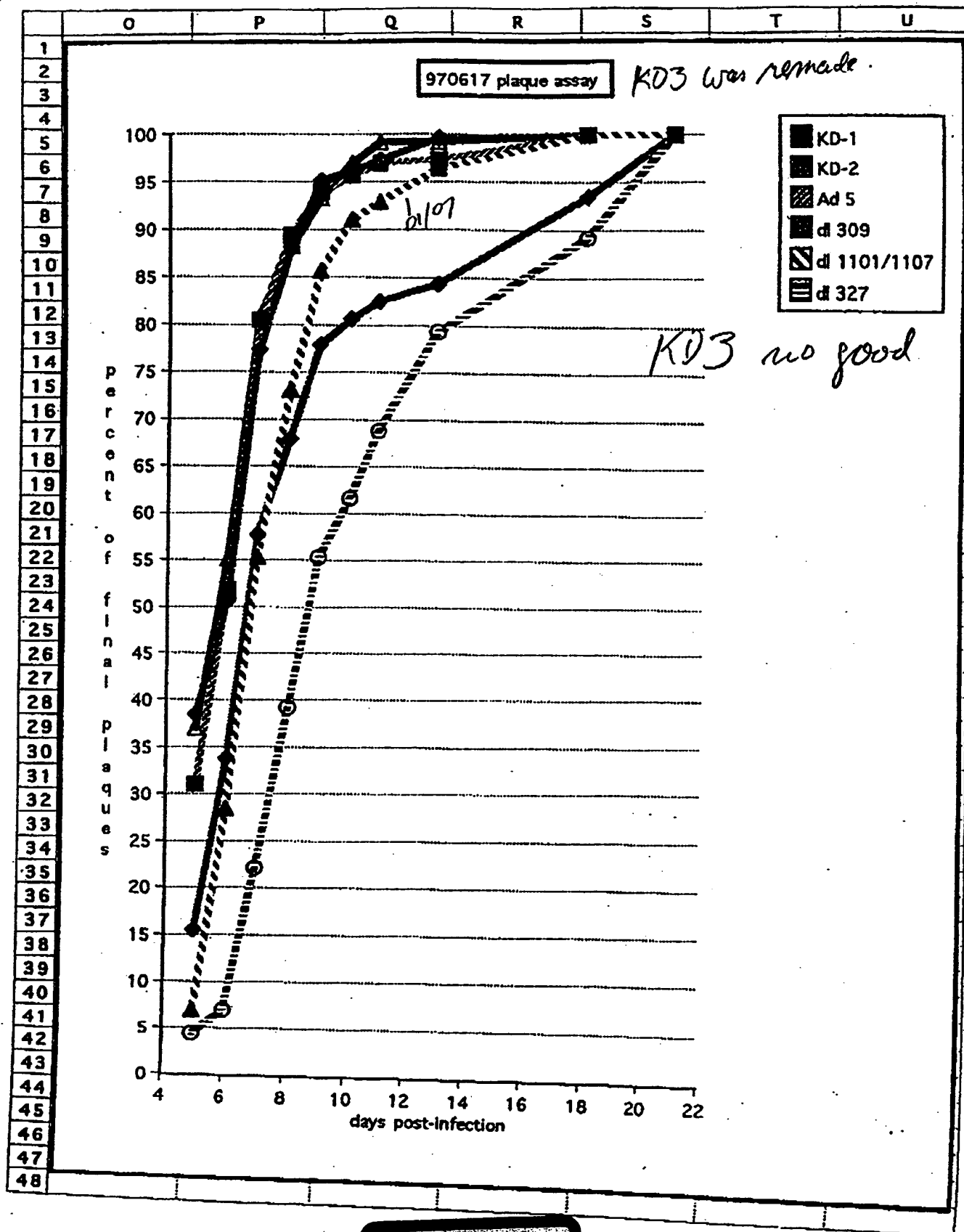
- Plaques are later than E4(+)
- Plaques are of different morphology (d1366 for me as well)
- Defect of linearization?

ii) 293 cotransfection of p626 E4 ↔ CMV + d1366.  
293 cotransfection with E4 expressing plasmids.

iii) Ann's results with KD 3

970617 Plaque Assays on AS49

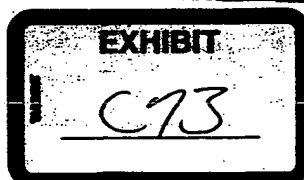
EXHIBIT  
C71



EXHIBIT

C72

	A	B	C	D	E	F	G
1	970617 PA						
2	KD-1	5	6	7	8	9	10
3		37	55.2	80.9	88.4	93.4	97.1
4	KD-2	5	6	7	8	9	10
5		15.6	33.9	57.8	67.9	78	80.7
6	Ad 5	5	6	7	8	9	10
7		31.2	51.9	80.6	89.5	94.1	95.8
8	d 309	5	6	7	8	9	10
9		38.5	50.8	77.5	88.1	95.1	96.3
10	d 1101/1107	5	6	7	8	9	10
11		7.1	28.6	55.4	73.2	85.7	91.1
12	d 327	5	6	7	8	9	10
13		4.5	7.1	22.3	39.3	55.4	61.6
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47							
48							



	H	I	J	K	L	M	N
1							
2	11	13	18	21			
3	99.2	99.2	100	100			
4	11	13	18	21			
5	82.6	84.4	93.6	100			
6	11	13	18	21			
7	97	97.5	100	100			
8	11	13	18	21			
9	97.5	99.6	100	100			
10	11	13	18	21			
11	92.9	96.4	100	100			
12	11	13	18	21			
13	68.8	79.5	89.3	100			
14							
15							
16							
17							
18							
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06/20/97

Kostya

1) E3 project

- i) Started cloning of CMV-E3 pm 734.1 <sup>→ Clone into SPC expression cassette to TC, anneal.</sup> expression cassette to left-hand plasmid (p#30) and into E3 (in place of Cydo's E3 deletion).
- ii) Started cloning of CMV-14.7 <sup>has zeocine pCDM3.13est</sup> expression cassette from pE1-14.7 (Terry-Chip) to left-hand plasmid.

2) Cancer therapy project

Have no plagues with SPB ↔ E4 promoter substitution. (293-TT1 mdm)

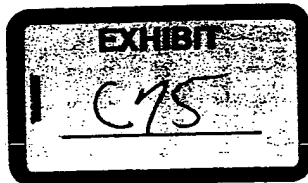
I'm starting with Rep/E4, ASH3/E4 from BT1, need to check them for ability to suppress growth of 366 (E4d1).

W162 - (expressing E4) - if Ann can find them.

Growing up plasmids containing E4 under the control of CMV and native E4 promoters. (for cotransfection)

Valeri Krongliak wrote me that he would be able to send us 293/E4 (VK2-20) when Dr. Wold write him a letter with request. His address is on the next page.

TI-E4 deletion cassette.



Karoly 6/20/97

E3 proteins

- I am growing up <sup>gp19K, pol II E3</sup> KT2 and <sup>gp19K, pol II E1</sup> KT9
- I am doing a Western with KT4 and KT6
- I am doing a time-course with KT7 and C+ (KT10?)
- I am cloning RID with CMV promoter into the shuttle vectors <sup>Have in Nippon's shuttle, Nihon shuttle. RID from Ad2 and Ad5.</sup>

Fork project

- I am <sup>Have 2 plagues</sup> growing the <sup>clones</sup> <sup>plagues</sup> These plagues grow very slowly in 1293/CrmA cells.
- MT2 promoter is in pCI2Pac (Lynda) (maybe: probably)

CrmA

- I have Crm A in Kriz's shuttle plasmid, I am going to make virus with it.

Cancer therapy

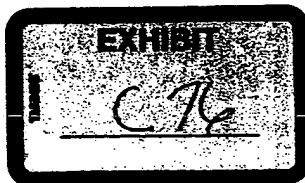
- I am fitting missing timepoints.

CMV-147 (Koty)  
CMV-gp19K (Nihon)

We need maps and sequence of plasmids that they sent us.  
Koty will check.  
Especially the left hand plasmid with  
RSVTR/LacZ

Given to GTI 6/18/97  
pCI-RID(5) } Chip  
pCI-RID(2) }  
pCI-gp19K

Will send to GTI next week.  
pCI-14.7K (Lynda)  
Send to GTI next week



22-141 50 SHEETS  
22-142 100 SHEETS  
22-144 200 SHEETS



Valeri Krougliak,  
Assistant Professor  
Institute for Gene Therapy  
Mount Sinai Medical Center, box 1496,  
One Gustave L. Levy Place  
New York, NY, 10029  
Tel. 212-824-7748  
Fax: 212-849-2437  
E.mail krougv01@doc.mssm.edu

295 expressing EU (VK2-20)

Published in Human Gene Therapy 6: 1575-1586  
(December 1995)

Have 3 plasmids with ~~EU~~ deletion.  
Can't rescue virus.





6/27/97 Kesiya

1) E3 project

i) Cloning of CMV-E3 pm734.1 expression cassette into left-hand plasmid and into plasmid with E3 deletion is in progress.

ii) Terry's pCI-14.7. Made miniprep of the plasmid, it looks like this is pCI with Ad5 14.7 in it. Made maxiprep, Karl is checking it for expression. Now doing recloning of CMV-14.7 expression cassette from this plasmid to left-hand plasmid.

2) Cancer therapy project

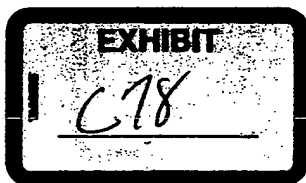
Got A549/E4; Hep/E4; W162 from Ann. Doing plaque assay of dl366 on these cells with 293 and A549 as controls.

Going to try to optimize transfection efficiency for these cells.

Going to try transfection-infection experiment (infection with 366, transfection with CMV-E4, SPB-E4 & E4-Epromoter as a control) on 293 cells.

Going to try cotransfect 293 with 1101/1107/E4R1 + CMV-E4 plasmid).

293/E4 (Valeri Krouglick)?



PINE 3.95 MESSAGE TEXT

Folder: MAIL Message 41 of 42 90%

Date: Mon, 23 Jun 1997 17:28:35 -0600 (CST)  
From: WOLDWS@SLU.EDU  
To: "KROUGVO1@DOC.MSSM.EDU"@SLU.EDU  
Cc: WOLDWS@SLU.EDU  
Subject: Request for cells

Dear Valeri,

I hope all is going well with you. I'm happy to see that you have a faculty position in a good university.

I am writing to request the 293 cell line expressing E4 (VK2-20) that you published in Human Gene Therapy (6:1575-1586, 1995). We have several plasmids with deletions in E4, and we have been unsuccessful in rescuing them into virus. We would use your cell line for that purpose.

Thank you in advance.

Sincerely,

? Help	M Main Menu	P PrevMsg	- PrevPage	D Delete	R Reply
O OTHER CMDS	V ViewAttch	N NextMsg	Spc NextPage	U Undelete	F Forward



970687

Gene Therapy Meeting

- ① FasL Ad Karl  
 13 of FasL vector ~ 11 plaque (23 plaques total)  
 1 blue + killed MCF7 - CrmA

3 plaques by PCR do have FasL gene.

PCR-FasL in Nipples left and shoulder. pBHG 11

Next

5 from 60 mm dishes

Check by TF - all plaques.

Check by PCR for FasL.

- ② Ad-14.7 PBK vector - expression at 14.7k pi  
 p7341 - gp19 exp., 14.7k exp.

- ③ C<sup>+</sup> kills cells at 2 days pi. C58 stock - strange discrepancy between particles & titers.  
 Raffinose → supernatant → perhaps some expression.  
 This plasmid expresses  $\beta$  gluc in transient/COS cells.  
 $\beta$ -actin promoter & out enhancer; pol II for 14.7k.  
 This was done at  $10^8$  PFU (titer could be much higher)  
 Repeat using titer calculated from OD & Dmazarone gel.  
 This was better than  $\beta$ -actin promoter/enhancer in COS.  
 Karl tried to make vector from several diff promoters/poal,  
 this was only one that gave plaques.

D... G... D... D... 1

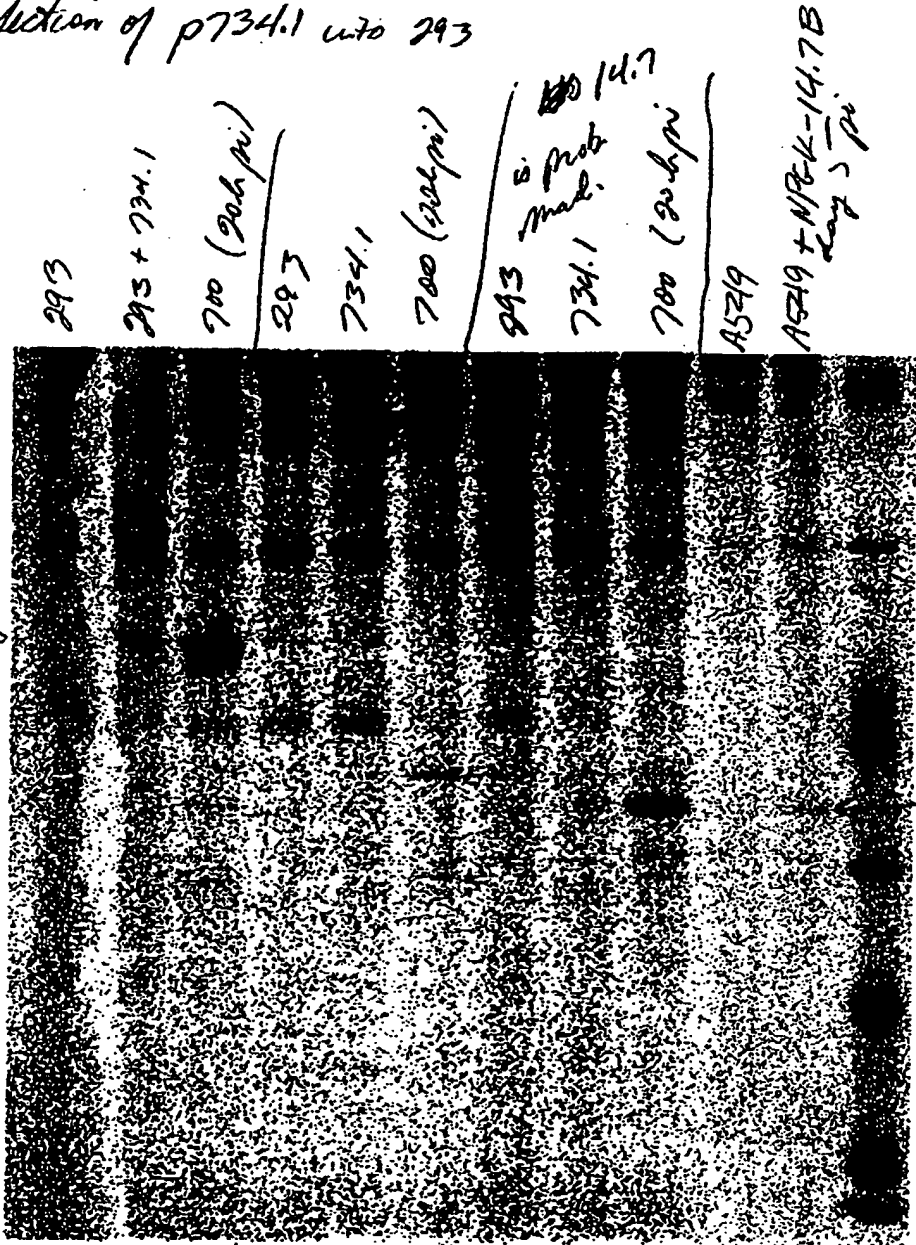


GEL 1997:06:27 12:46:35, Range - 0.01-249.86 Counts, 1.00x

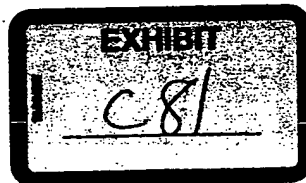
Karl

Transfection of p734.1 into 293

exposure  
overnight on  
PhosphorImager.



$\alpha$ 9p19K	+	+	+							
$\alpha$ RIDB				+	+	+				
$\alpha$ 14.7							+	+	+	+



Mohan, 6/27/97

## 1 C.F. project:

- a) 4 plaques (SPC Rep78 virus?) <sup>(new got C18)</sup> are growing in 293 278 cells. 3 plaques showed CPE. Growth is slow ~ 100% confluent.
- b) RT-PCR for Rep78 antisense RNA were done this week employing RNA + Reverse Transcriptase to verify the PCR fragment is due to RNA and not from DNA contamination. It seems 293 / Rep78 cell line is expressing Rep78 antisense RNA.
- c) pSub VIII plasmid → chips → plasmid preparation. Eligible with mole.

## 2 E3 project:

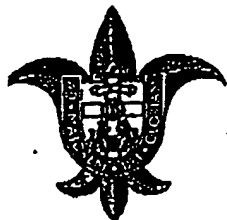
	Particles / OD	OD	SPU
a) 9 got six viruses from			
	pt/ml	OD	SPU
+ d1704	$2.4 \times 10^{11}$		$0.97 \times 10^{12}$
d1722	$1.35 \times 10^{11}$		$0.77 \times 10^{12}$
d1731	$1.44 \times 10^{11}$		$1 \times 10^{12}$
d1739	$7.7 \times 10^{10}$		$1.72 \times 10^{12}$
d1753	$1.07 \times 10^{11}$		$1.18 \times 10^{12}$
d1762	$1.58 \times 10^{11}$		$3.18 \times 10^{12}$

d1704 SPU is lesser than pfm. (Repeat)  
 - do  $10^8$  pfm +  $10^9$  pfm

- b) MCF-7 cells transfected by p2E1SPK/gp12K and p\*30 (Nimpen's) gp12K (\*2, \*3 & \*) got contaminated. (Yeast Repeating again for I.F.)
- c) Cloning Ad2, Ad5 RID into p2E1SPK and p\*30 is in progress (from Karl)
- d) KT1 (14.7 LacZ) gave  $6.2 \times 10^6$  pfm → None CPE  
 Stacks → 500000 - 1.1

EXHIBIT

C82



1402 South Grand Blvd.  
St. Louis, MO 63104  
Phone: 314-577-8432  
FAX: 814-773-3403

**SAINT LOUIS  
UNIVERSITY**

Department of Molecular  
Microbiology & Immunology

Health Sciences Center  
School of Medicine

**Facsimile Transmittal**

**Date:** 12-19-02

**From:** William Weld

**Phone:** 314-577-8432

**Fax:** 314-773-3403

**Deliver to:** Dan Kaster

**Phone:** \_\_\_\_\_ **Fax:** 552-7305

**Total number of pages including this page:** 15

**Message:**

8 - 100MM

7/13

todo

phone:

Ab in white/red File on Arms desk

Inventory virus bank \* label / + volume

✓ (KBS from freezer) / when brought up

$2 \times 10^5 / \text{ml}$

Develop the gel (Monday)

$7.5 \times 10^7$

✓ (cells frozen + thrown out) ✓

(leave serum / media)

no less than 2.15%  
3mls / 200mls cell

Ad 1 + Ad 6 Virus stock (5mls of stock)

Set up  
1-100ml → stock

Grow up 11.6 pre-Absorbed. ✓ Set up

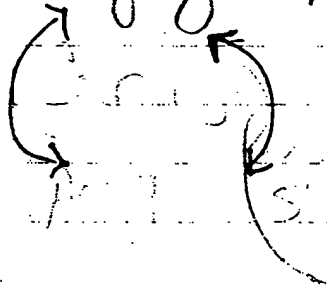
293 cells from Kaye (Diplo) OK  
Ginsberg H5N1 (earliest stock) (175 flasks)

V9103 5-2-1 stock 50ml → 100mm plate → flasks

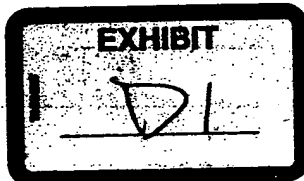
V9103 5-4-1 spin down / media 20% FBS 100ml → 100mm plate

(harvested) (960725)

Bayley 11/07/6 (911003) 104-8 loc 50ml → 100mm plate



freeze / thaw  
harvested (960725) 104-8



9/4/96

CSD Banded the virus Ad1 960825  
1101/1107 Baileys (960802)

- 1 freeze (thaw)
- 2 sonicate X 2
- 3 Vol after son 1101 < 2mls  
Ad1 < 19mls

add  $V \times 0.51 = g$  of GCL

10.71g in 1101/1107 Baileys  
9.69g in Ad1.

infect 3 liter spinner with  
dl 717 Vp 891208 Titer  $1.3 \times 10^{11}$

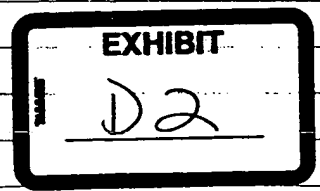
cell count 3 liter  $3.5 \times 10^5$   
Vol = 3 liters (3000mls)

$3.5 \times 10^5 \times 3000 \text{mls} = 10.5 \times 10^8 \text{ total cells}$

use 20 pfu's / cell

162ul use  $\frac{0.105 \times 10^{11}}{1.3 \times 10^{11}} \times 20 \text{ pfu's}$

KB's are healthy no clumping.





9/17 ~~9/18~~

1 Atlanta 6013E  
 $\frac{19}{4} \times 3 =$  <sup>first</sup>  $1.4 \times 10^5$  (cells are shriveled up)

\* 2 Brahitakee  
 6m1228  
 $\frac{28}{4} \times 3 =$  cells look very healthy  
 $2.1 \times 10^5$

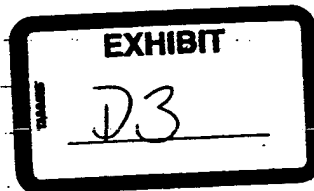
3 NYC Apa 4819  
 $\frac{31}{4} \times 3 =$  nice + healthy cells very  
 flat + round  
 $2.3 \times 10^5$

4 present 4m1938  
 $\frac{21}{4} \times 3$  cells are dividing now  
 smaller cells but healthy  
 $1.5 \times 10^5$

5 NYC AF B4870  
 $\frac{22}{4} \times 3$  cells look great  
 $1.6 \times 10^5$

6 Biow 6m0741  
 $\frac{21}{4} \times 3$  strange shape of cells  
 Rough edges not round  
 $1.5 \times 10^5$

Infected 3 liter spinner with  
 1101 / 1102 20 mls  
 $3.2 \times 10^5$  cells/ml



September 18, 1996.

Cloning EcoRI-Xba B fragment to pBSSK(+)/EcoRI+XbaI  
of pFG140

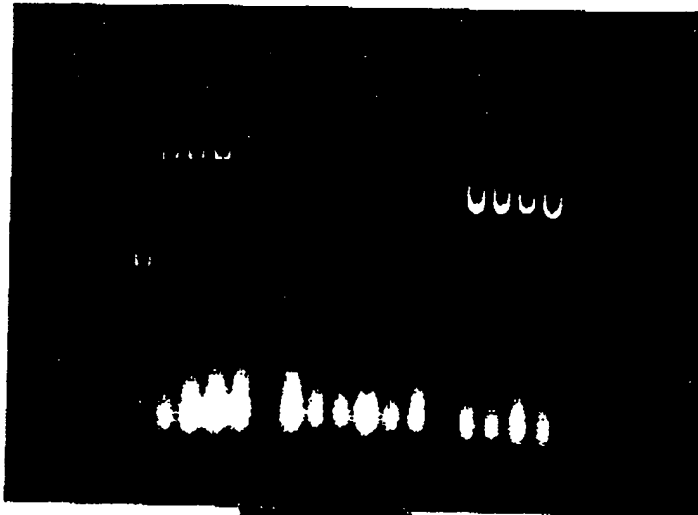
Lanes: unprep of

1) pBSSK(+)

2) - 9) clones

10-12) p21 (Mippen's plasmid)

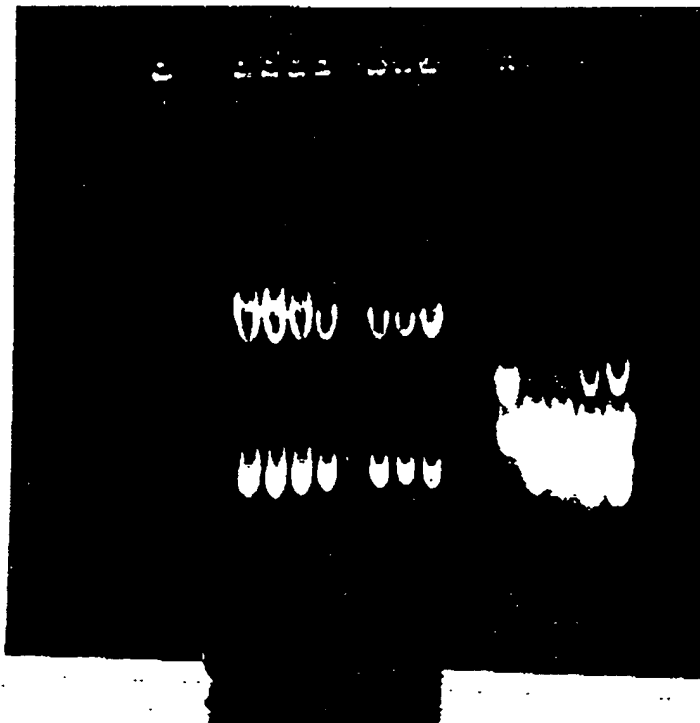
14) - 17) pISP-C3.7



First experiment  
09/18/96

Digestion pattern of  
the plasmids.

- 1) Ladder
- 2) vector pBSSK(+) RI/XbaI
- 3) fragment B pFG140/RI/XbaI
- 4) - 11) - RI+XbaI clones 1-8
- 13), 14) - p21 (Mippen) EcoRI
- 15) - 18) - pISP-C3.7 Hae + EcoRI



EXHIBIT

D4

22-141 50 SHEETS  
22-142 100 SHEETS  
22-144 200 SHEETS



pBSKS(+)+ 6 hr nt pG/ko RI/AB

(PK1)

Lanes : 1) Ladder

2) p1 + NdeI

3) Bst 1107 I

4) Sun I

5) Bst 1107 I + Sun I

multicore

⇒ size of RI-Nde fragment?

⇒ DNA masked 600 bp ~~K+~~ ~~RI~~

Bst 1107 I - Sun I fragment

2% agarose gel

1) Ladder

2) pK1 / Sun I + Bst 1107 I

+ RNase

⇒ ~600 bp fragment

EXHIBIT

DS

Checking the restriction  
pattern of plasmids

in ladder

2) L1 / Mfe + R1

3) L1 / Xba

4) L2 / Mfe + R1

5) L2 / Pst

6) L3 / Mfe + R1

7) L3 / Pst

EXHIBIT

DL

28 September 1994

minipreps

1) Ladder - ul  
2, 3, 4) - pLSP-R 2.2  
5, 6, 7) - L2  $\Rightarrow$   
 $\Rightarrow$  pLKHE2A + Bam + end + cl

8, 9, 10) - L3  $\Rightarrow$   
 $\Rightarrow$  pCR(LKH dl) Bam + end E2A +

SPB experiment  
10/27/96

minipreps.

1) Ladder  
2) - 3) - L1  $\Rightarrow$   
 $\Rightarrow$  pTZAd - Xba

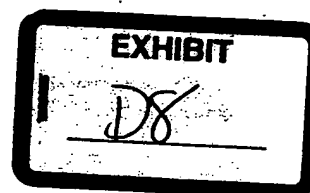
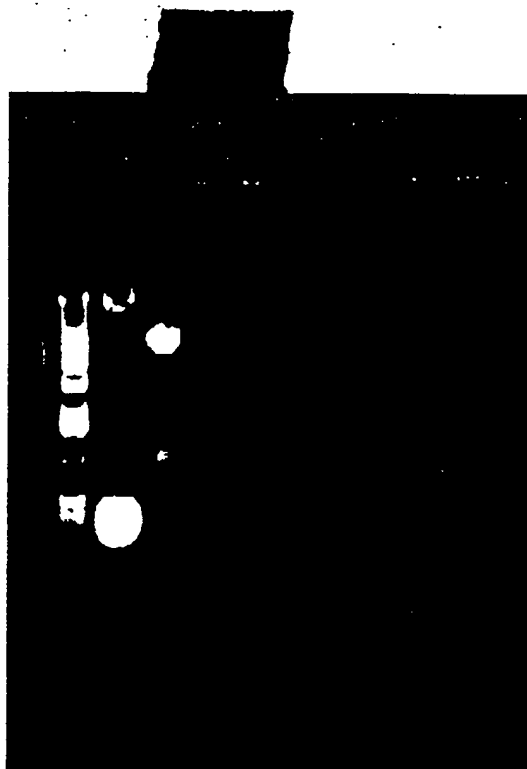
EXHIBIT

D7

September 30, 86.

Cloning of c-myc promoter into  
Bst 1107I site of p21 (Nippon).

- 1) ladder
- 2) p21 / Bst 1107I
- 3) pCDNA3 / Bgl II + Bam HI

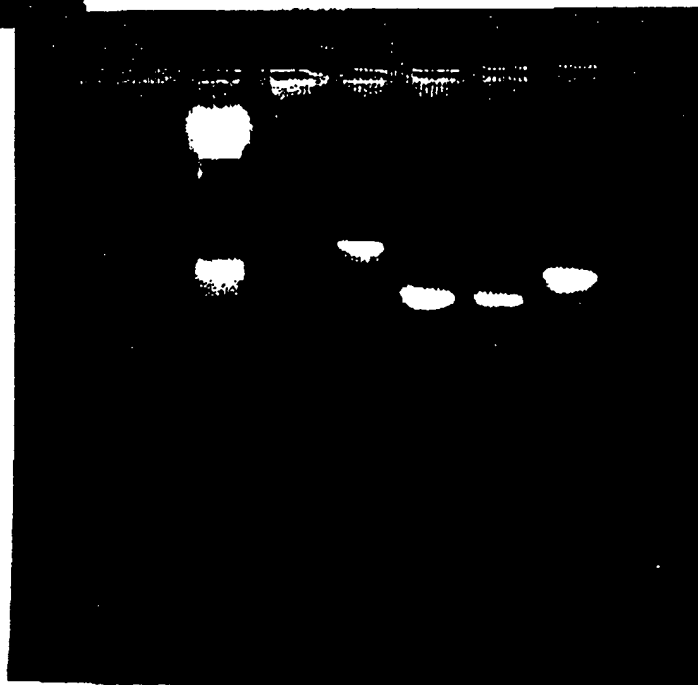


22-141 50 SHEETS  
22-142 100 SHEETS  
22-144 200 SHEETS



October 2, 86

Testing primers in PCR



- 1) Ladder
- 2) KJ2 - KJ3
- 3) KJ1 - KJ2
- 4) KJ4 - KJ5
- 5) KJ6 - KJ7
- 6) KJ8 - KJ9

all 9 primers  
are OK.

October 9, 96

Analysis of clones

1-2, 4-8 of

pK1 / bst NOTI + 2.1 + GIP  
+ 19K\* (with mutation)

1) ladder

2) pK1 / RT + PacI

3) - 9) - clones / RT + PacI

clones 1, 4-8  $\Rightarrow$  recombinant $\Rightarrow$  clone 2 - wt. $\Rightarrow$  name recombinant  
plasmid (K2)

October 21, 96

Analysis of unimproved  
restriction~~restriction~~

1) pL2 / SacII

2) - 8) clones

1-7 / SacII

9) - ladder.

 $\Rightarrow$  1, 4, 7 - recombinant  
orientation?Cloning KDI ADP  
10/11/96

EXHIBIT

D9

October 27, 96.

Analysis of final prep  
by restriction.

1) ladder

2) p21 / KpnI

3) - (14) clones

p21 / bst + CMV prom.  
Bgl + Bam + Klenow →

→ clones 125 - 136 Kpn

clones 25, 26, 28, 31  
the orientation that I need  
(allowing transcription)clones 27, 28, 29, 30, 31, 32  
35, 36 → other orient.+ clone 23 from  
other cloning site.15 - 26) clones p21 / bst + PCR product -  
- promoter SP-B (500 bp) with Bst I sites  
on the ends

⇒ clones 225 - 236 / KpnI

⇒ clones 27, 28 ⇒ correct orientation

+ clone 23 from previous cloning

clones 25, 31, 32 ⇒ other orientation.

Cloned SPB prom.  
in E4 10/26/96

EXHIBIT

D10

50 SHEETS  
100 SHEETS  
200 SHEETS



$C_{primers} \approx 70 \text{ pmol}/\mu\text{L}$

361/1380 SmS  $\rightarrow$  to sequence 30x (1914 \* 1)

1761 492 use up 1 and 103

200/1481 Bst1

Wednesday, October 30, 98.

- 1) Bex clone 1, 4(?) - need preparation for sequencing
- ✓ 2) Purify ADP-X6 fragment, purify pL1/Xba/CTP vector

Ligation	insert (ADP-X6)	vector
	0.15 $\mu\text{L}$	0.107 $\mu\text{L}$
control	15 $\mu\text{L}$ H <sub>2</sub> O	CTP vector
4 experiment	45 $\mu\text{L}$ insert	5 $\mu\text{L}$ vector

+ 5  $\mu\text{L}$  buffer (5X) + 1  $\mu\text{L}$  ligase  $\rightarrow$  1 hr room temp

Thursday October 31, 98

- 1) 283 cells tomorrow will be ready to pass  $\Rightarrow$  prepare HEBES and  $\text{CaCl}_2$  What about 2X media?
- 2) Sequence p1
- 3) Prepare red ADP-X6 insert / Ligate, transform
- 4) Order primers for sequencing p2 inserts
- 5) first, repeat PCR with p1u p2
- 6) Ask Mahon about TP-2 and ADP

$$C = 7.5 \text{ pmol}/\mu\text{L} = 0.75 \text{ ng}/\mu\text{L}$$

Cloning KD3 ADP

EXHIBIT

D11

Sequencing

pK2 (8p19k\*)  $\Rightarrow$  clone 1

- Mix - 8  $\mu$ l
- Template - 1  $\mu$ l
- Primer - 5  $\mu$ l  
(KD1 or KD3)
- $H_2O$  - 6  $\mu$ l

P.T.  $\rightarrow$  96°C

96°C - 30"

50°C - 15"

60°C - (4 min!)

 $\int$  25 cycles  $\Rightarrow$  KD1, KD3

HEBS 2x for 200 ml

- ▼ 2 g HEPES
- ▼ 3.2 g NaCl
- ▼ 0.148 g KCl
- ▼ 0.039 g  $Na_2HPO_4$  (anhydrous)
- 0.4 g glucose

final pH = 7.0.

 $CaCl_2$  2.5M

MW = 147.00

for 100 ml

36.75 g ▼

22-161 50 SHEETS  
22-162 100 SHEETS  
22-164 200 SHEETS

EXHIBIT

D12



Monday, 4, November 1996. (clavary small volume!)

- ✓ 1) Purify fragment ADP-obs, ligate, transfer OHSα.
- ✓ 2) When transferring OHSα, seed cells in SOB-agar for preparing competent cells.
- ✓ 3) Order primers for sequencing p21 element.

Ligation  $\frac{\text{vect}}{\text{inset}} \left( \frac{L1}{ADP-obs} \right) = 0.1/1$   
 $= 0.01/5$

Ligation (promega)

control 1.5 μl vect + 8 μl H<sub>2</sub>O + 1 μl ligase  
 exp. 1.5 μl vect + 1 μl fragment + 1 μl ligase → 2 h room temp

! Sequencing failed ⇒ too low p<sub>xxx</sub>!!!  
 Repeat with both primers 3x more template  
 3x more primers

mix → 8 μl  
 template → 4 μl  
 primers 1/3 = dilute 1/10  
 take ① - 2 μl (3)  
 ② - 2 μl (5)

+ 6 μl H<sub>2</sub>O (1)  
 + 4 μl H<sub>2</sub>O (3)

! There are no E3 polyA sites in L2!  
 May be it can use fiber's gene pA?  
 Moreover, there are no acceptor splicing site  
 in your construct. How can it be expressed?

Check electrophore an expression of inserts in the  
 deletion of E3.

Splicing in Ad, esp. E3 splicing.

22:14 50 SHEETS  
 22:14 100 SHEETS  
 22:14 200 SHEETS

EXHIBIT

D14

Tuesday 5, November 1996.

- 1) Repeat sequencing: 3ex 1 clone. primers 1 and 2.
- 2) Seed clones new 4ex (5 clones) on sectors.
- 3) Prepare competent cells DH5 $\alpha$ .
- 4) Check ~~all~~ number insert into p21 with other restriction sites, start clone it into p21.

Sequencing  $\rightarrow$  with primer 3 have a precipitate.  
with primer 1 precipitate is much less.

Wednesday 6, November 1996

- 1) Extract plasmids from clones 4ex (5 clones), check if they are right.
- 2) 4) - from yesterday.

Thursday 7, November 1996.

- 1) Seed clones for Lambda culture for miniprep with Wizard Plus miniprep kit for sequencing.
- 2) PCR with pFur of ADX (primers 4, 5)

75  $\mu$ l - H<sub>2</sub>O  
 1  $\mu$ l - template p21 (no)  
 10  $\mu$ l - 10x buffer  
 1  $\mu$ l - primer 1  
 1  $\mu$ l - primer 2  
 2  $\mu$ l - dNTP  
 1  $\mu$ l - pFur  
 10  $\mu$ l - DMSO

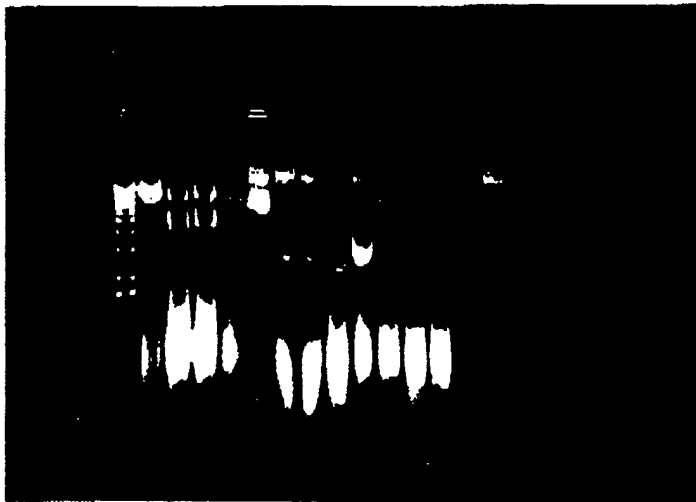
- 3) Prepare vectors L1/Xba and pB161 / ~~Spol~~ I - large fragment
- 4) Check env in p21 (Nde I)
- 5) Check new uncutted DNA for MW?
- 6) PCR of inserts into p21  $\rightarrow$  w. 46 SP-B it is possible to check orientation!

EXHIBIT

D15

hru 11, sparse yet electrophoresis.

- 1) - Ldder.
- 2) - 21
- 3) - 123 Junc 5 (buffer D, orange).
- 4) - 125
- 5) - L1
- 6) - 10) 1-5 clones exp.
- 11) - 14) L1/xls prep.
- 15) - pBAG11 / RI prep.



Conclusions!

1) it's on with the new  
preparation L1

2) it's on with  
pBAG11 RI

3) L1 clones → trash  
4) L1/xls → trash.

November 10, 1996, Sunday, November 11, 1996, Monday

- ▼ 1) Split 293 cells on new flask.
- ▼ 2) Overlay 293 dishes with neutral red.
- ▼ 3) by electrophoresis of Wizard minipreps and L1/xls.
- 4) PCR of clones + electrophoresis.
- 5) CIP pBAG11/RI, cut from the gel?
- ▼ 6) Get p21/cmv and scori, get the fragment from the gel?
- ▼ 7) Change the medium in 293 flask.
- 8) (New prep. of L1?) Clean up old preps?
- ▼ 9) Seed 54, 57 and L1 for Wizard miniprep!

EXHIBIT

D16

Tuesday 12, 1986

Cannot cut 200 after Wisard kit miniprep.  
 123 - with EcoRI - pent, to be from gel  
 L1 - with XbaI - large fragment!

Wednesday 13, 1986.

1) CHA pRUG13, cut fragment from gel, cut fragment 123/R1.  
 2) Try to cut L1 with XbaI, if not successful, seed L1 9/11

3) Ligate from 1).

1200 vol + 500 vol + 100 vol each  
 - 100 vol - control

L1/ste not in single band. Extract with Pstadi  
 → seed it in ligase culture

BAG11/R1/CIP - A - fragment - not single band  
 → ready to distinguish between all this forms.

Thursday 14, 1986.

1) Transform DH52 with ligase mix from yesterday  
 (Try to obtain high efficiency!!!)

2) Extract L1 with Wisard, cut XbaI, run together  
 with yesterday's (1) XbaI (one) of on the gel.

Try PCR! Maybe you can use it for screening 9/11!

Sequencing with new battery only 32/111

PCR (Taq polymerase)

for 150 µl

10 µl buffer  
 2 µl dNTP  
 4 µl MgCl<sub>2</sub>  
 1 µl Taq pol  
 30 µl H<sub>2</sub>O

1) 123  
 2) 125 (primers 10, 11)

3) 223 (insert in p21)  
 4) 227

5) 221 - control (-)

6) 223 (primers 8, 10)  
 7) 227 (primers 9, 11)

→ check orientation

10) 54 (primers 6, 7)

11) 52

12) PL2 - control (-)

cut 5' end with PstI  
 L1 - control

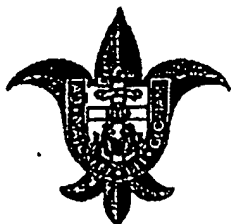
12 reactions

15 (10-11)  
 2-3 (10-11)  
 2-3 (10-11)

225 with 5' end  
 227 with 5' end

EXHIBIT

D17



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Date: 12-19-02

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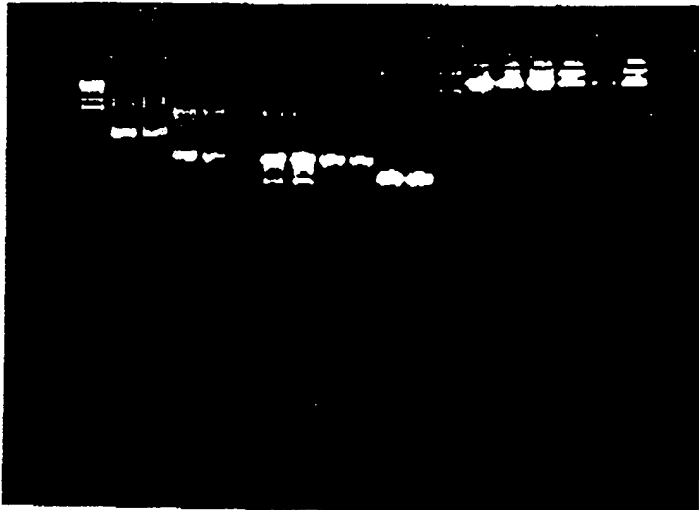
Phone: Fax: 552-7305

Total number of pages including this page: 15

Message:



*See explanation  
of the picture  
on  
previous  
page.*



*Conclusion: everything is fine  
except that I didn't do out DNA  
(because of buffer 4, I think).*

*Friday 15, 1996.*

- 1) ~~Transform~~ L1! Clean up L1 prep., try to out with the*
- 2) Seed lanes of pRH611 + 123 (CMT).*



22-141 50 SHEETS  
22-142 100 SHEETS  
22-144 200 SHEETS

EXHIBIT

D18

HAL 294. W138

Friday (1:00 /

Monday, 18, 1996.

✓ 1) Analyse clones (1-24) pBUG11/11 + CMV (125 base)  
Run run cut and then cut with Nde I

✓ 2) Run about Srf I.

✓ 3) Transform L1.

✓ 4) Sequence PCR

✓ 5) Prepare TP-DNA, TP-DNA/RI, Ad5 DNA, Ad5 DNA/R

✓ 6) Split 293 to dishes for transfection

Sequencing.

✓ 8 µl pre mix  
✓ 5 µl p31 (0.5x)  
✓ 1 µl primer (V21)  
✓ 6 µl H<sub>2</sub>O

✓ 20 µl oil

circling.

⊗ pBUG11 gave 2 small fragments instead of 1.  
check what is it?

clones gave incomplete digestion → O/N Met  
after PEG precipitation

Thursday, November 19, 1996.

1, 3, 5, 6 from yesterday.

if fail in 1, do PCR with 10, 11 primers!

Freezer at Cf room 3 shelf from top  
left drawer  
upper box (-4)  
tube with 918 on cap  
(V520) on side

→ Ad5  
CSA

EXHIBIT

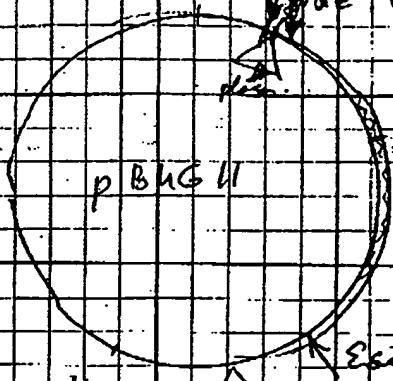
D19

50 SHEETS  
22-141 100 SHEETS  
22-143 200 SHEETS



RTS here if placed based on PR

9/1/00 C-0015  
Nde 9 (in place of de EU)  
pasmit part ~ 2064



Nde I fragments

~ 18000  
~ 8540  
~ 2300-500

Nde 31089

DEE3 (3000)

ES0015 27351

R1 A fragment of (23 (P2) + CHV)

1 kb. amp.

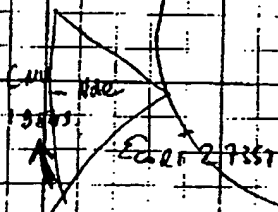
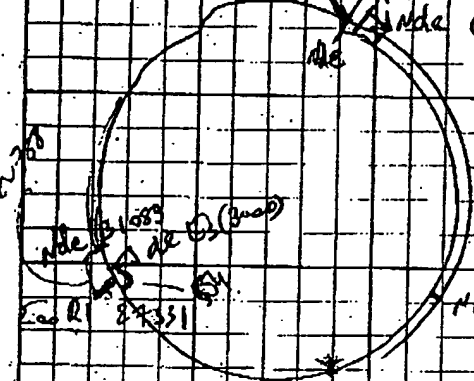
correct or

wrong orient

R1 Nde (n!)

Nde 31089

R1 Nde (n!)



Nde 13549

~ 18000 same as wt  
~ 8540 same as wt  
~ 5000  
~ 3500 instead of 4000  
3505

8281 ~ 18000 same as wt.  
~ 8540 same as wt. slightly differ  
~ 5000  
~ 3500 instead of 4000

- 1- Bldw
- 2- ch 403
- 26- 5-10-15
- to 13

~ 18254 same as wt  
~ 8540 same as wt  
~ 5000  
~ 3500

~ 18254 same as wt  
~ 8540  
~ 5000

34287

EXHIBIT  
D20

← But it is not like this with ~~EcoRI~~ and ~~NdeI~~  
 Because you were able to see  
 ↳ It's like this, leave NdeI digestion of p21  
 gave linear form.

⇒ Incomplete digestion? (with NdeI)

⇒ cut with EcoRI  
 and PacI + BamHI (pBAG 11 as control).

1) ladder  
 minipreps: (6 ex)

3-26) - clones 1-26

⇒ clones 4, 7, 9, 14, 18, 21  
 → trash.

clones 1, 2 and other  
 with same pattern are  
 with correct orientation of  
 insert?!

Partial digestion with  
 NdeI!

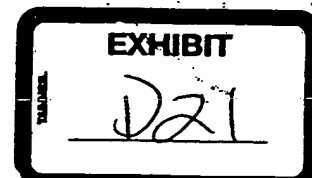
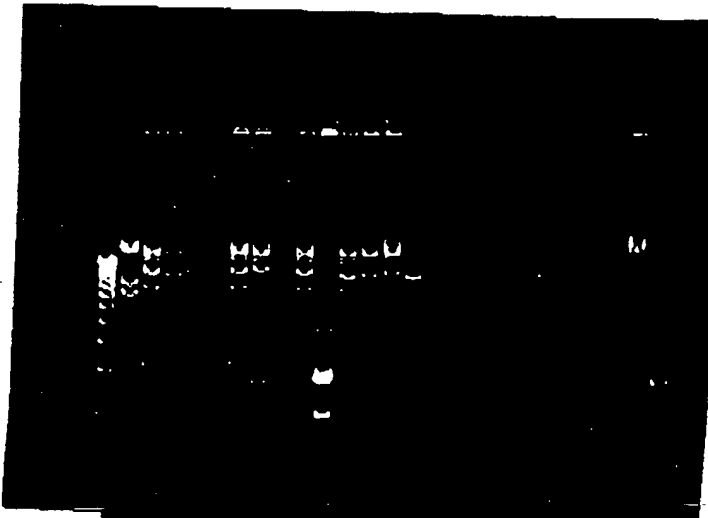
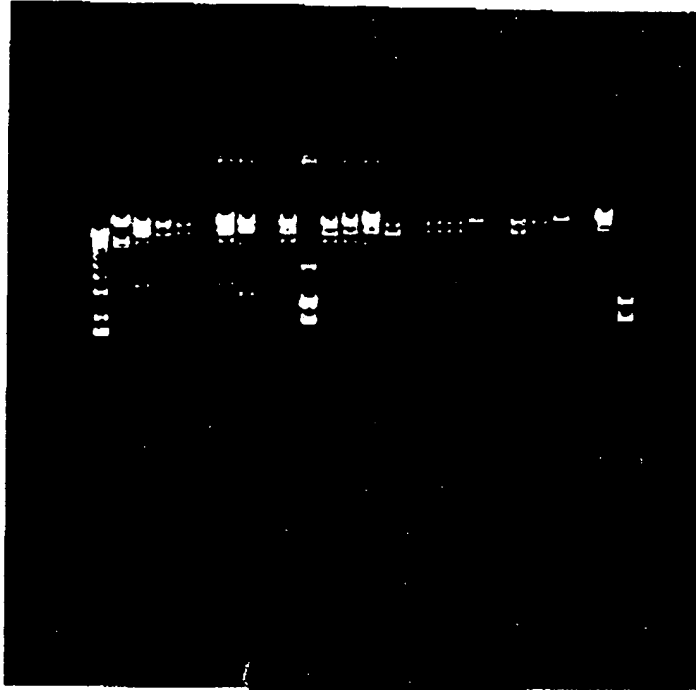
Bottom picture is the  
 same.

Or cloning is partially  
 digested (BamHI)  
 or star activity digested?

take to analyse RI

1, 3, 5, 6, 17, 19, 21

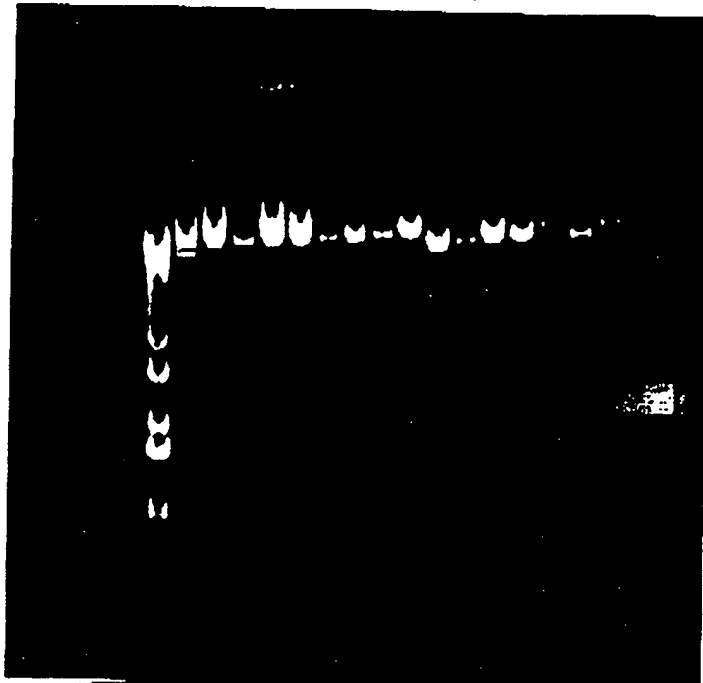
22-141 50 SHEETS  
 22-142 100 SHEETS  
 22-144 200 SHEETS



Pack + Bam → NEB Buffer (4) = green

both enzymes

~~EcoRI~~ → ~~Multicore~~ → Buffer 11, Promega



1) Cadder

2) BUC11 / R1

3) 1

4) 3

5) 5

6) 8

7) 12

8) 13

9) 21

(10) BUC11 / Bam + P<sub>ac</sub>

(11) 1

(12) 3

(13) 5

(14) 6

(15) 17

(16) 14

(17) 21

(18)

Conclusions! 17, 21 are OK by EcoRI digestion  
others are result of EcoRI star activity  
when preparing vector.

Pack Bam

→ pBUC11 gave more fragments than  
expected  
all clones are similar and different  
from pBUC11. Wrong orientation?  
They have different origin of rep.  
P<sub>ac</sub> did not work in clones?

17, 21 are not OK inserts are too small 11/27/99

EXHIBIT

D22

23-141 50 SHEETS  
23-142 700 SHEETS  
23-144 200 SHEETS

2 orientations

10000

11000

8000

7500

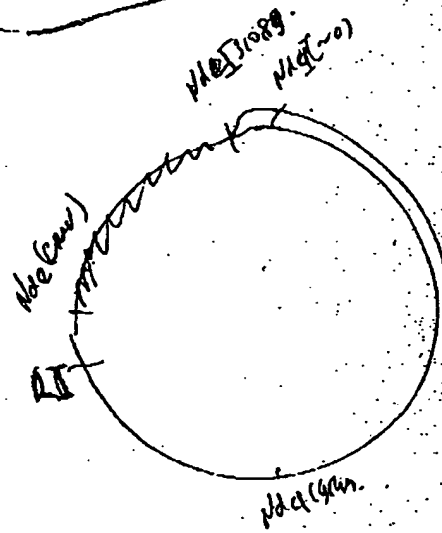
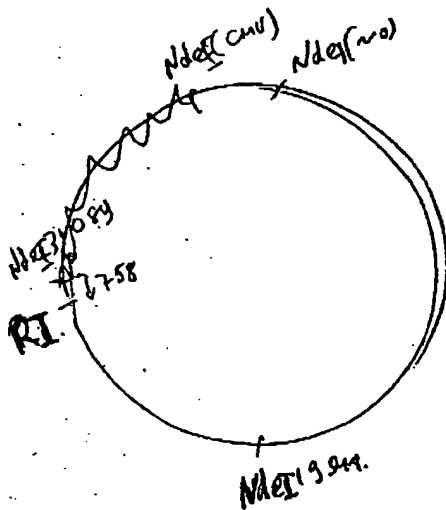
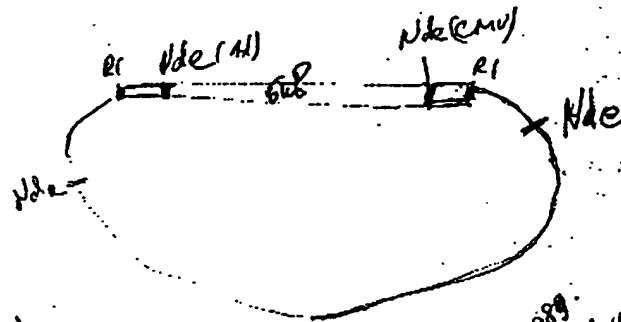
5000

5000

3000

2700

you can explain  
it just in the case  
of larger fragments  
are made of  
part of hydrogens



EXHIBIT

D23

if it is mixture of 2 plasmids  
and  $\Rightarrow$  there are just 2  $\Delta$ dc sites?

EXHIBIT

D24

Wednesday, November 20, 1996.

Thursday 21 November

- 1) Seed L1 for mini (midi) prep. with Wizard!
- 2) Get TP-DNA AD5 with Eco RI, check on G/F, dilute against TE.
- 3) Ampicillin AD5 DNA, check amount, get Eco RI, phenol, precipitate.
- 4) Split 293 to dishes for transfection.
- 5) Sequence clones.
- 6) Ampicillin and vector pBHG/RI/ZIP ligate with 12/10 insert.
- 7) Seed 17,21 clones for further characterization.
- 8) Get pBHG with RI, Nde, Bam, Pst, Bam + Pst, etc. with Wizard kit!
- 9) Check Sbf I site in pEG140, pBHG, p1, something?

Friday, November 22, 1996.

- 1) Transfection of 293 with pL2 + TP-DNA AD5/RI or ~~AD5/RI~~
- 2) Extract 17,21 and L1 with Wizard miniprep.
- 3) Sequence clones.

seq #2 3 ex, clone 1 (31) - primer 10, 2.

seq #3,4 2 ex, clone 23 (223) - primers K10, K11

seq #5,6 1 ex, clone 23 (123) - primers K10, K11

seq #7,8 5 ex, clone 4 (54) - primers K6, K7.

8 µl premix  
 5 µl template (0.58)  
 1 µl primer  
 6 µl H<sub>2</sub>O

40 µl oil  
 circling

EXHIBIT

D25

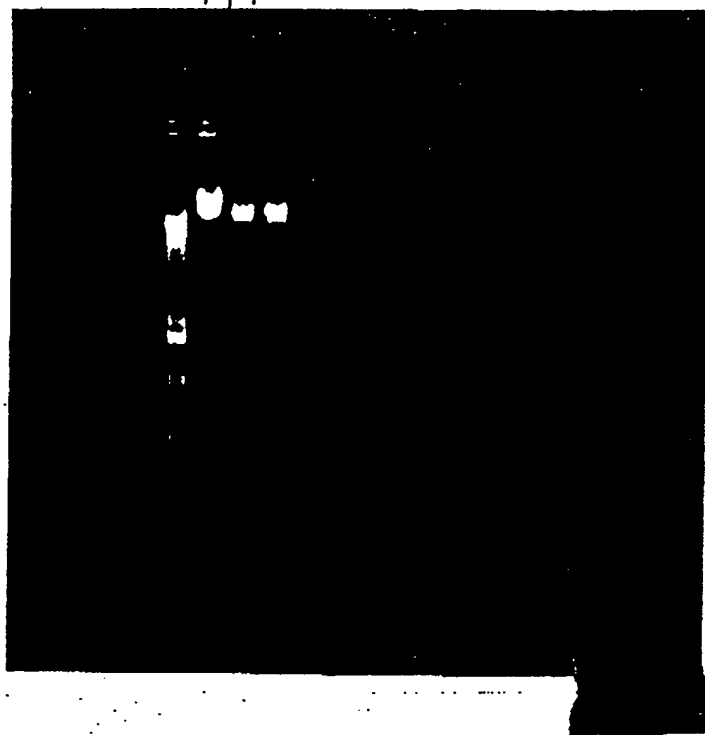




22-141 50 SHEETS  
22-142 100 SHEETS  
22-144 200 SHEETS



- 046119  
- done 17  
- done 21



1) ladder

2) 04611A

3) done 17 Spe I

4) done 21

there are no fragments  
~ 6000 bp  
⇒ wrong orientation  
or what?  
⇒ repeat cloning.

EXHIBIT

D27

Thursday, November 27, 1996

1) pBR322/1/20 → extract from gel  
 L1/Xba → CIP → extract from gel  
 ligate to inserts o/n

2) pBR322 (1/21/CIP (new prep, 0.1/1) → 12 μl  
 1.2.3 insert (old prep 0.05/1.5) → 7 μl

2 μl buffer  
 1 μl enzyme

o/n 16°C

1) pL1/Xba/CIP (new prep, 0.1/1.5) → 12 μl  
 3(PCR)/Xba insert (new prep 0.1/1.5) → 5 μl

→ 2 μl buffer  
 → 1 μl enzyme

o/n 16°C

Wednesday, 28, 1996

1) Transform DH5α cells with ligation mixtures from yesterday, try to obtain high efficiency!  
 plate cells in duplicates, 1/10, and all

2) Plan scheme of experiments to obtain larger plasmids, check everything, start cloning.

3) Split 293 in flask.

Friday 30, 1996

1) Seed clones 6ex, 7ex in liquid culture and agar plates

2) Split 293 cells, overlay 293 dishes with transfection!

EXHIBIT

D28

Saturday, November 30, 1996.

1) Extract Gex 25-36 with Wizard kit, cont. with  
SpeI Extract wex 1-24 with  
cont. with Sac II.

2) from yesterday  
SpeI - NEB Buffer II  
Sac II - buffer C / orange

3) Check references about splicing in Ad, especially  
in ES and filler!

4) Start with genes IL and IK?

\* Filter NEBS and cell<sub>2</sub> from freezer 2 time! !

WB  
There is no SpeI site in CMV promoter according  
to my sequence  $\Rightarrow$  may be clones 17 and 21  
from previous cloning are OK?

Sunday, December 2, 1996.

1) Check new Gex clones with EcoRI, select recombinants

2) Check new wex clones with XbaI, select recombinants

Bug 11/1A  
1251/1A  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36



1)

- 1) Ladder
- 2) DUG11/R1
- 3) 123/R1  $\Rightarrow$  A fr.
- 4  $\Rightarrow$  25-36

Recombinants:

26, 28, 29, 3, 33, 36.

e) Can't see  
fragment  
on XbaI hydrolysis.

3) Hex SacII (1 site in ADP), no sites in CF  
 + RI (0 sites in ADP), 1 site in CF

expected fragments

correct orientation ~ 1261

wrong orientation ~ 1561

orange buffer (C)

4) Gex clones Pco + Bam.

1h Pco (buffer NEB1 + BSA)

↓ heat inactivate

↓ + 1x buffer (E)? + Bam → 1h → E/E

(D)?

NEB 1 - 10 mM Tris-HCl, 10 mM MgCl<sub>2</sub>, 1 mM DTT (pH 7.2)

BamHI - 150 mM NaCl, 10 mM Tris-HCl, 10 mM MgCl<sub>2</sub>, 1 mM DTT (pH 7.9)  
 unique NEB buffer.

buffer D - pH 7.9, Tris-HCl - 6 mM, NaCl - 150 mM, pH 7.9  
 orange  
 D - yellow.

buffer C (orange) pH 7.4, 10 mM Tris-HCl, 10 mM MgCl<sub>2</sub>, 50 mM NaCl

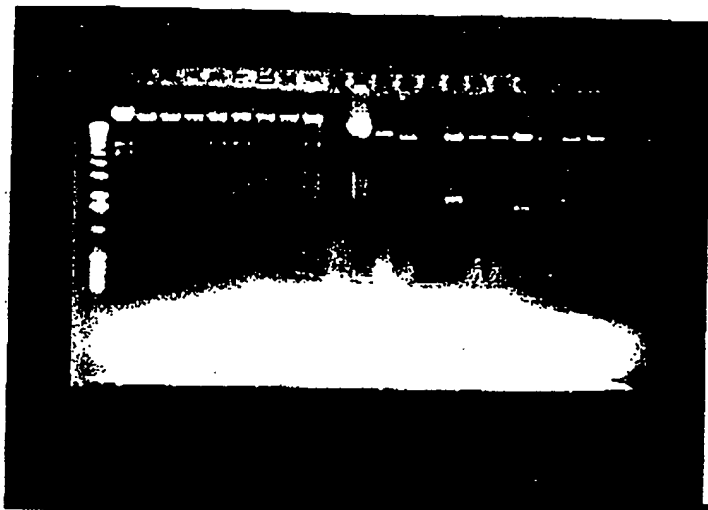
core (white) pH 7.8, Tris-HCl - 25 mM, acetate

100 mM K acetate, 10 mM Mg acetate

Take orange 2X?

Cloned UDS AOP

12/2/96

22-141 50 SHEETS  
22-142 100 SHEETS  
22-144 200 SHEETS

1) ladder

2) pUC11 / Pac + Bam

3) 17

4) 21

5) 26

6) 28

7) 29

8) 31

9) 33

10) 36

11) blank

12) L1 / Sac II + R1

13) - 241 - clones

hex (1-12) / Sac II + R

the same gel,  
higher magnitude.

Conclusions:

hex -

- clones

2, 5, 6, 7, 8, 10 -

- correct orientation

clones 4, 9, 12 -

- wrong orientation

hex - absolutely  
unclear  
what is happening.

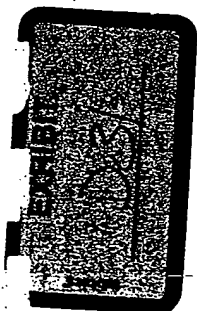
yellow ←

Tomorrow try to cut with Nde I,  
take 10 µl of plasmid, good activity  
of Nde I.

Try some other enzymes? (Not Pac  
Not Bam)

universal  
IX. ←

for example Spe I, Srf I.  
correct or ⇒ 448





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**Deliver to:** Dan Kasten

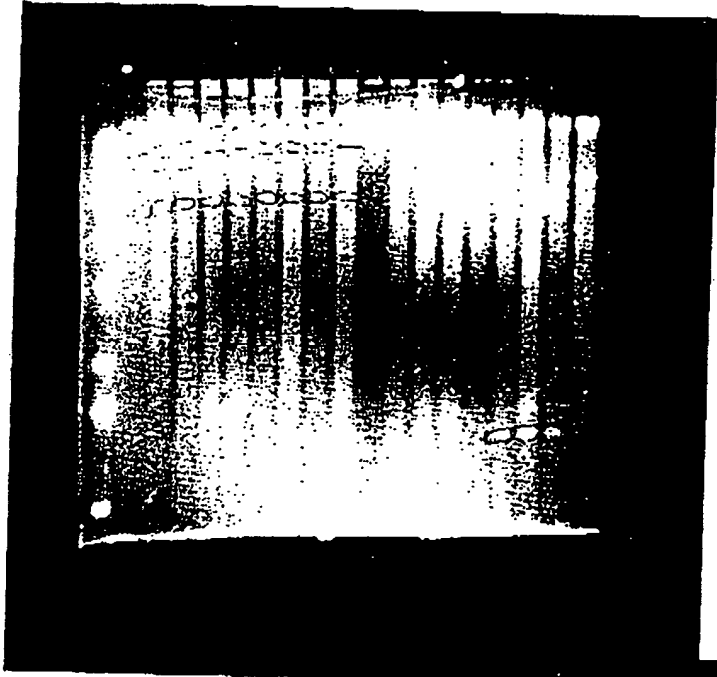
**Phone:** \_\_\_\_\_ **Fax:** 552-7305

**Total number of pages including this page:** ~~18~~ 18

**Message:**

Tuesday, November 6, 1996

1) cut 600 clones with Kde (Bsp. I), yellow  
and  $\Delta$ rf + SpeI (Bsp. I) (Bsp. I) (Bsp. I)



Conclusions: 7, 21, 24, 37, 33 - one orientation  
26, 28, 36 - other orientation

If consider the previous picture, 26, 28, 36  $\rightarrow$  correct only after  
fragment. because there was additional 6 kbp R-Bin

Obviously, there is SpeI site in CMV 17, 21  
didn't give fragments because they are  
wrong orientation (on SpeI hydrolysis)





Wednesday, 4, 1996

1) Cut Gex clones with SpeI. (buffer Multicore)

22-141 50 SHEETS  
22-142 100 SHEETS  
22-144 200 SHEETS



1) ladder

2) pBK611 / ~~Spet~~ SpeI

3 - 100

17, 21, 26, 28, 29, 31, 33, 36  
- SpeI

there is fragment

Gib in (26, 28, 36)

⇒ correct orientation

there is fragment

1200 bp in 29, 31, 33

⇒ wrong orientation

17, 21 - junk! look  
also to upper fragment  
on the previous picture.

Conclusion: When everything is OK, it's OK.

Friday, December 6, 1996

1) Cut pFG140 → BamHI + NdeI fragment (9457)  
(contains EcoRI site, other fragments do not).  
other fragments at ~2500 - if there is no NdeI in pnx2?  
1200 } 2043  
6000  
if there is NdeI site in pnx2.

at 293(p21-s08) with NdeI + BamHI - vector

2) pspit 293 cells.

3) ~~Reseed~~ Reseed clones to new dish

4) ~~Insert~~

Monday, December 9, 1996

- 1) and 3) from Friday.
- 2) Prepare LR for preparative ~~gating~~ of ~~ex~~  
Inoculate LB overnight (15 min)
- 3) Prepare the 4x4 pH (8.5) (8.0) (7.5) (7.2),  
autoclave.

Can use 1104/1107 for ~~confirmation~~ to attempt  
to obtain a vms with E4 promoter  $\rightarrow$  SP-B promoter  
substitution.

- 4) Start cloning EcoRI-Sal fragment pG140  
into: pK2 (gp19C+)

(pG140 - BamHI - Nde - Buffer)  
 (Sal - EcoRI - Buffer)  
 993 (p2 + SP-B promoter) - Nde - BamHI - Buffer - vector  
 pK2 (31, gp19C+) - EcoRI - SalI - Buffer - vector.

pG140 Sal - EcoRI - expected fragments!

17869  
 10585 ← that is what I need  
 contains BamHI site!  
 6905  
 379  
 There is  
 SalI, then. instead of 17869 it will have ~9000.  
 ~5869

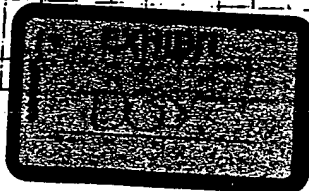
Wednesday, December 12, 1996

- 1) Extract max prep of 6ex (clone 26)
- 2) Extract Wisard 4ex (clones 2, 5)
- 3) Prepare vectors and fragments from yesterday,  
+ 4RX (2) Sal + RL
- 4) Check n2, 45 with XbaI; p2 + SacII (sequence 11)

223/ Bam-Hda → 1 m... 2,3?   
 Bam HT, start det... M.S. there is 2 site   
 for Bam HT?   
 → 5) ⇒ Seed 42 (45) and 993   
 WMP   
 also site   
 It also can explain   
 fragment on Bam...   
 P66 (100KB) and de...   
 liso   
 13) ... (7 exp...   
 P66/100 kb-EuRI → 100 (100KB) (0.1/10)   
 (100KB) (0.1/10)   
 72. 10 µl vect + 10 µl ...   
 72. 10 µl vect + 10 µl ... + 2 µl AT + 1 µl ...

Thursday, December 12, 1996

- 1) Take 626 plasmid from cell. - EtBR → 2nd spin
- 2) Extract 223 WMP (42, 45 - didn't grow)
- 3) Transform <sup>old</sup> E. coli mix from yesterday, why? (6)
- 4) Split 293 cells
- 5) Transform 42, 45 make WMP props immediately!!   
 Seed 42, 45 again → to dish this time!   
 Transform mix 42, 45   
 Need to sequence 42, 45 - need WMP.   
 2) Grow up 54 (42 + ADP) → ready for cotransfection!



day, December 12+1, 1886.

- 1) Purify 226 from Col. 52  
2) Check amount of Col-RI fragments  
Col-RI fragments are

Saturday, December 14, 1941

- 1) Prepare (B), sterile eppendorffs, <sup>sterile</sup> TE, <sup>sterile</sup> water
- 2) Dissolve 626 prep in sterile (!) TE. <sup>black</sup> plate with
- 3) Split 293 cells to dishes. <sup>transfection</sup> 626+ cells
- 4) Repeat transformation of <sup>old</sup> prep. at <sup>concentrations</sup> <sup>plate</sup> cells
- 5) Transform DUB2 (new prep) with 42, 45, <sup>plate</sup>

7. ex, 7c  $\Rightarrow$  10  $\mu$ l of each to 100  $\mu$ l of old  $7H5x$  cells.

42, 45  $\Rightarrow$  0.001 g of each to 100  $\mu$ l of new H5A cells

Monday, December 16, 1996.

Tex, Tc  $\Rightarrow$  no clones again, efficiency of transformis  
pretty high.

What's wrong?  $10^4 \times 10^3 \approx 10^7 / 1 \mu\text{g}$  pL1  $\Rightarrow \approx 10^8 / 1 \mu\text{L}$  pL1

Not optional notice vector / insert (?)  
pBBSK was pBBSK (?)

- 1) Dissolve 626 100 $\mu$ l in sterile TE, check on OLE amount and quality of the plasmid, check other plasmid as well.
- 2) Transformation of ~~285~~ with 626 + left arm.
- 3) Ligate 7 $\mu$ l again, transform DH5 $\alpha$ , 5 $\mu$ l vector, 15 $\mu$ l insert.
- 4) Seed 42, 45 to liquid culture (LB).

PMV - left arm plasmid (1.5  $\mu$ l) 7  $\mu$ l (10 $\times$ )  
 pBB2 - (PUC119 derivative) (0.5  $\mu$ l) 100  $\mu$ l (50 $\times$ )

✓ 1.5 ml 2X HEBs

✓ 1200  $\mu$ l H<sub>2</sub>O.

✓ DNA (107  $\mu$ l)

✓ 150  $\mu$ l CaCl<sub>2</sub>.

✓ 3 ml  $\Rightarrow$  for 6 dishes

2X Overlay

22-141 50 SHEETS  
22-142 100 SHEETS  
22-144 200 SHEETS



(for 100 ml overlay)

50 ml 2X DMEM

5 ml 7.5% NaHCO<sub>3</sub>

2 ml FCS PS

4.3 ml 1.8% Noble agar.

Tuesday, December 17, 1996.

7ex  $\rightarrow$  no clones. Something in fragment preps. interfere with ligation? (It is possible, because of this red colour strip)

1) Seed iCMVITTE, 54 (L2+ADP) into large scale

ii TK (34)  $\rightarrow$  small scale guide culture  $\rightarrow$  W4

2) Extract 42, 45 with Wizard mini prep, then seed (42, 45) for medium scale prep.

repeat preparation of this fragments.

3) Try precipitate fragments 140/5R, 31 5R to purify them.

4) Try partial digestion p223 Bam Nde (Nde - complete, Bam HI - partial, dephosphorylate, try cloning with 140 B N

Try to clean them with Wizard system.



Wednesday, December 18, 1996

Thursday, December 19, 1996

Cut pFG140 → (Ban + Nde) (buffer D)

→ SalI + EcoRI (buffer D)

Cut 223 with Nde → then with BanII (partial) →  
(complete)  
→ ~~band~~ → CIP → Section from gel.

Cut 31 with Sal + EcoRI (buffer D)

Cut 223 EcoRI (buffer D)

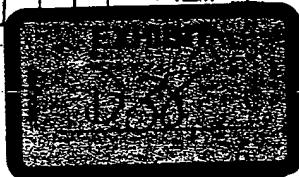
31/P, 140/P, 223 Nde, 223 P, 140/Ban Nde

Sunday, December 22, 1996

- ✓ 1) Overlay dishes 295 with neutral red.  
Split 293 cells to dishes → repeat transfection.  
Seed from 293 cells for 1st passage.
- ✓ 2) Check 31, 31/Sal, 31/RI, 31 Sal + RI to estimate  
molecular weight of the plasmid, 223/Nde, cut partial  
with Ban II.
- 3) Cut fragments from gel, ligate.
- ✓ 4) Seed (CMV/TTA) 519 for large scale liposome culture.
- ✓ 5) Seed (Fb) plasmid for WAP.

Sunday, December 29, 1996

- ✓ i) Check i) CMV/TTA - with Pst II, Sac I.
- ii) p54? → HindIII + XbaI, Pst I.
- iii) p54 (rep) - Pst I, 2% agarose.
- iv) 412 - XbaI
- 415 - XbaI



- \* 2) Split 293 cells to dishes for transfection  
 3) Cut 1101/1107 DNA with *EcoRI*.

Transfection:

- 2 dishes pEG1w.  
 → 2 dishes E1 + pBAG11  
 → 2 dishes E1 + pBAG11 deGAP CMT from ins.

First attempt  
 to make KO1  
 12/04/96 (7)

500  $\mu$ l 2x HEBS + 450  $\mu$ l H<sub>2</sub>O + 20  $\mu$ l pEG1w.  
 + 1 + 20  $\mu$ l BAG11 + 50  $\mu$ l GCL  
 + 1 + 20  $\mu$ l BAG11 (E1 + CMT)

Precipitate is coarse  
 again where E1 plasmid is used  $\Rightarrow$  purify it (SCE bagging)

Saturday, December 4, 1997.

- 1) Cut 1101/1107 with *EcoRI*.  
 → 2) Split 293 to dishes, cotransfect 1101/1107 with L2  
 → 3) Pick up this ugly things resulting plaques + to plate to try to  
 grow up a plaques.  
 → 4) Overlay dishes with NR.

Overlay 2x 200  $\mu$ l

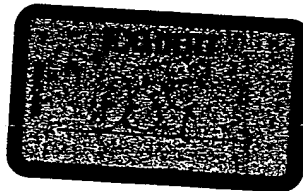
200  $\mu$ l 2x DMEM  
 4  $\mu$ l 2x PS  
 4  $\mu$ l 5% yeast extract.  
 3  $\mu$ l FBS  
 10  $\mu$ l HS  
 2  $\mu$ l 100x chloramphenicol  
 20  $\mu$ l Ricin 7.5%.

Transfection. 1101/1107 (RT) + control (Hv)  
 2(x) + L2 (20x)  
 + 54 (20x)

4  $\mu$ l of each transfection mixture

2  $\mu$ l of 2x HEBS.  
 1.8  $\mu$ l of H<sub>2</sub>O  
 DNA  
 + 200  $\mu$ l GCL 2.5M.

50 SHEETS  
 100 SHEETS  
 22-141  
 22-142  
 22-144



Wednesday, 8, 1996.

- 1) Spin left hand plasmid in  $\text{CaCl}_2$  gradient & fine.
- 2) Set 238 to dishes for transfection.
- 3) Cut 31 with EcoRI  $\rightarrow$  complete digestion and  
with Sal I  $\rightarrow$  fragment dephosphorylate.
- 4) Cut 225 (21 + SPB from) / Mde with BamHI partial  $\rightarrow$  dephospho.  
 $\rightarrow$  fragment from gel & Vector.
- 5) Fragments 16. Sal + Mde, Bam + Mde  $\rightarrow$  cut from gel.
- 6) Ligate. 728, 100 overnight.
- 7) Precipitate 1101/1107 DNA end time, cut with  
EcoRI!
- 8) Sequence 42.
- 9) Run experiment with TAC gene.

Thursday 9, 1996

- 1) transform Karl's left-hand plasmid

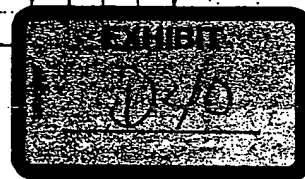
Monday, 14, 1996

Transfection 5  $\times$  loc 2 (5  $\mu$ ) + 15  $\times$  626 (15  $\mu$ ) (1:3)  
or 10  $\times$  loc 2 (10  $\mu$ ) + 10  $\times$  626 (10  $\mu$ ) (1:1)  
or 5  $\times$  loc 2 (5  $\mu$ ) + 20  $\times$  626 (20  $\mu$ ) (1:4)

Ligation 8  $\times$  225 / Mde + Bam (partial) C-T-P  
+ 160 / Bam Mde B fragment

Thursday, 17, 1996

- 1) Sequence 42, primers (21) 4, (22) 5  $\rightarrow$   
sequence  $\rightarrow$  109, 15101  
 $\rightarrow$  No sequence at all!  
What is it?





8 pl primer  
 3 pl p223  
 7 pl primer (4 or 5)  
 8 pl H<sub>2</sub>O

circ long

Monday, 20, 1996.

8 ex (p223 / complete hydr. Nde + Partial Bam)  
 (+ B fragment pFG140 / Bam + Nde.)

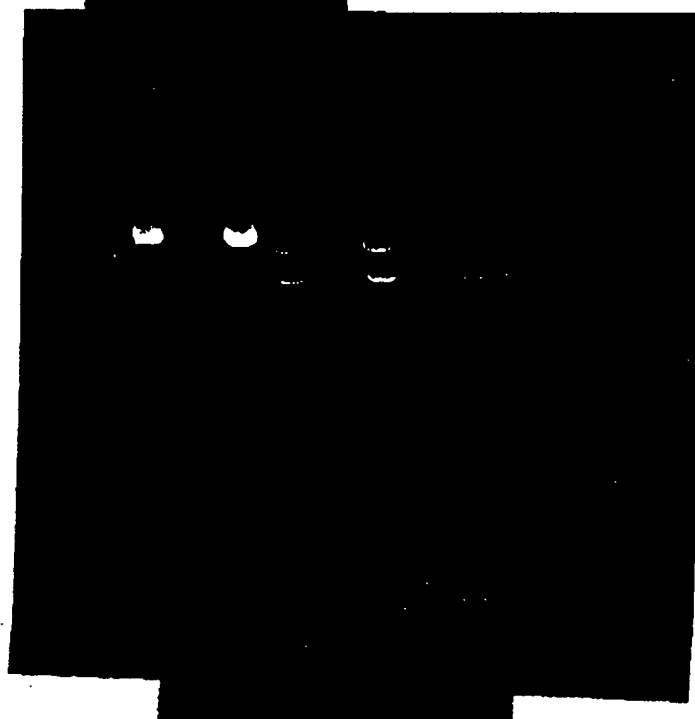
Mini-preps: 8 ex (1-12)

1) Ladder.

2) p223.

3) →

clones 8 ex 1-12.



1) Ladder

2) pFG140 / Bam + Nde

3) p223 Bam + Nde.

(upper fragment -  
 because of incomplete  
 Nde digestion)

4) 81

5) 82

6) 86

7) 87

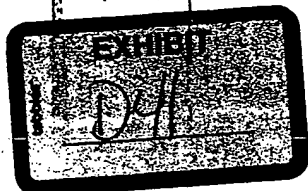
8) 88

9) 89

10) 816

clones 82, 86, 87,

22-141 50 SHEETS  
 22-142 100 SHEETS  
 22-144 200 SHEETS



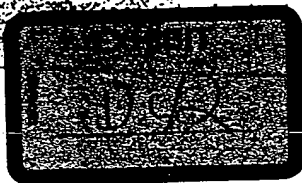
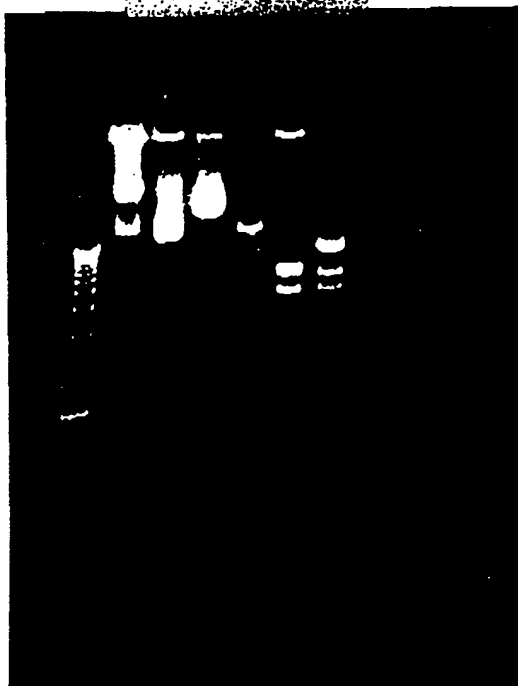
(Cloning Gex)  $\Rightarrow$  82 / ~~Not~~ Xba - vector 1 fragment  
 ~ 10 bp  
 1 fragment ~ 9 bp

insert p81 / EcoRI + Xba - 1 fragment  
~~Not~~ ~~Not~~ Xba  
~~Not~~ Xba

Ligation Vector 82 / ~~Not~~ Xba 1 fr. 5' AT (0.1/10)  
 insert 31 / ~~Not~~ Xba 1 fr. 5' AT (0.1/15)  
 +  
 2 ml ~~Not~~ H<sub>2</sub>O.  
 1 ml ~~Not~~ H<sub>2</sub>O.

EXCISE map. of 82

- 1) Collier.
  - 2) 240
  - 3) 223
  - 4) 82
  - 5) 110
  - 6) 225
  - 7) 82
- Bar. + Not.



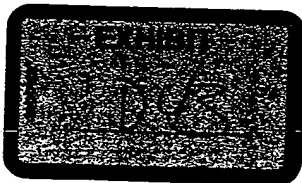
January 25, 1997.

g c and gex  $\rightarrow$  ~100 bact. colonies / dish  
in both cages  $\Rightarrow$  (Deletion)Transfection: 1101/1107/ECORI (0.5  $\mu$ l)  
+ pK82 (E4  $\rightarrow$  SPB) (10  $\mu$ l)  
+ CMV/TTE (2  $\mu$ l)

10 6cm dishes: 4 control + 6 experiment

- 1) control A) 8  $\mu$ l (4  $\mu$ l) 1101/1107 (1 ml prep)  
2) control B) 8  $\mu$ l 1101/1107/ECORI + 5  $\mu$ l CMV/TTE  $\Rightarrow$  (4  $\mu$ l) (10  $\mu$ l)  
 $\Rightarrow$  control on wt and toxicity of TTE.

- 3) exp. 8
- $\mu$
- l (1101/1107/ECORI)
- $\Rightarrow$
- 4
- $\mu$
- l

A) + 10  $\mu$ l p82  $\rightarrow$  10  $\mu$ l  
+ 3  $\mu$ l CMV/TTE  $\Rightarrow$  6  $\mu$ lB) 8  $\mu$ l 1101/1107/ECORI  $\Rightarrow$  4  $\mu$ l  
+ 50  $\mu$ l p82  $\Rightarrow$  5  $\mu$ l  
+ 5  $\mu$ l CMV/TTE  $\Rightarrow$  10  $\mu$ lC) 8  $\mu$ l (1101/1107/ECORI)  $\Rightarrow$  4  $\mu$ l  
+ 15  $\mu$ l p82  $\Rightarrow$  15  $\mu$ l  
+ 1  $\mu$ l CMV/TTE  $\Rightarrow$  2  $\mu$ l22-141 50 SHEETS  
22-142 100 SHEETS  
22-144 200 SHEETS

Sunday, February 2, 1987

transfection

8 large dishes.

2 - 626 + 627 (left-hand)

2 - 41 + 627 (left-hand)

2 - 1101/1107/RT - control + CMV/ITR

2 - 1101/1107/RT + p82 + CMV/ITR

498 JMA for 2 ml of precipitate - each dish

(626) 4 ml of precipitate  $\Rightarrow$

$\Rightarrow$  2 ml NEBS 2X + 150  $\mu$ l 626

p62 = 80  $\mu$ l (40x)  $\checkmark$  2 ml H<sub>2</sub>O

p627 = 40  $\mu$ l (40x)  $\checkmark$

(41) p41 = 40  $\mu$ l (40x)  $\checkmark$

p627 = 40  $\mu$ l (40x)  $\checkmark$

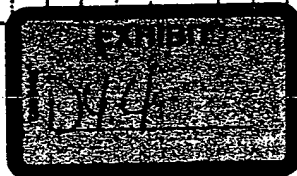
(82-control)  $\checkmark$  1101/1107/RT - 25  $\mu$ l (12x)

$\checkmark$  pCMV/ITR - 20  $\mu$ l (40x)

(82-exper.)  $\checkmark$  1101/1107/RT - 25  $\mu$ l (12x)

$\checkmark$  pCMV/ITR - 20  $\mu$ l (40x)

$\checkmark$  p82 - 30  $\mu$ l (40x)



Wednesday, February 5, 1997

Transfection of esi with 626 + Lec 2 (Mohan's with STR)  
~~626~~ + Lec 2 (--- a ---)  
 626 + Lec 2 (Grod's pM54...)

(626 + M)

2 ml HEBS 2X + 2 ml H<sub>2</sub>O + 100  $\mu$ l Gd<sub>2</sub>

✓ p 626 - 100  $\mu$ l (50x)

✓ pMohan's - 5  $\mu$ l (8x)

(626 + M)

✓ p DUG 11 - 50  $\mu$ l (50x)

✓ pMohan's - 5  $\mu$ l (8x)

(626 + C)

✓ p 626 - 100  $\mu$ l (50x)

✓ pM54 - 20  $\mu$ l (20x)

TTC TCTAG A GT.... ATGA CACTTGA

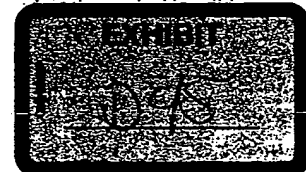
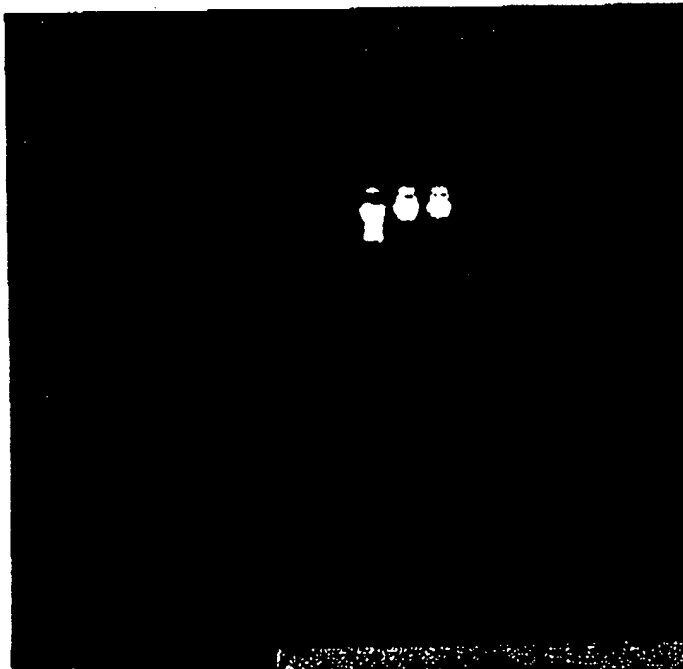
1) Ladder

2) - 42 / X6

3) - 45 / X6

⇒ linear form

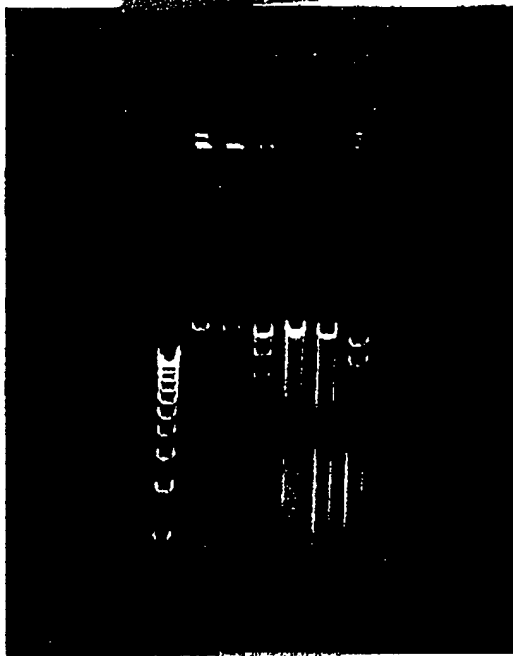
2nd X6 in the  
 plasmid is methylated!



22-141 50 SHEETS  
 22-142 100 SHEETS  
 22-144 200 SHEETS



Sunday, February 9, 1997



Analysis of 11011102 (R1)  
 54  
 plagues 54-2

1) Collier

2) 11011102 Pcc

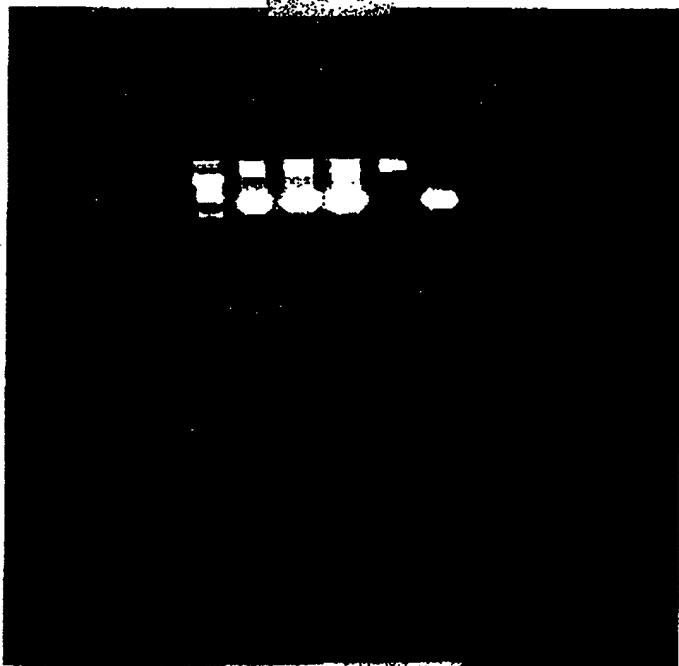
3) Pcc + BamHI

4) 54-2

5) 54-2 Pcc

6) 54-2 Pcc + BamHI

Conclusion 54-2 - wt  
 but there are  
 additional bands



PCR primers  
 (D1, K1)

1) Collier

2) pF6140

3) pR2

4) p54

5) plagues 54-2

Conclusion -

54-2 → wt G3



February 10, 1997.

Transfection of Mohr's 293/CNV/TTF with p82.

**Control** : 50  $\mu$ l of 1101/1107/EcoRI (.108)  
 + 20  $\mu$ l pCMT/TTF (.208)  
 + 100  $\mu$ l p82 (.1008)

3 ml H<sub>2</sub>O  
 3 ml HEBS 2X  
 300  $\mu$ l CaCl<sub>2</sub> 2.5M.

**p82** 50  $\mu$ l 1101/1107/R1.  
 + 20  $\mu$ l pCMT/TTF  
 + 100  $\mu$ l carrier DNA

February 11, 1997.

Repetition of ex. Vector  $\rightarrow$  CIP  $\rightarrow$  Heat inactivation

92/R1-K6 (Vector) - 5  $\mu$ l -  
 31/R1-K6 (insert) - 10  $\mu$ l  
 Lig. Buffer - 2  $\mu$ l  
 Ligase - 1  $\mu$ l.

February 14, 1997.

Transfection with 1101/1102/EcoRI + pL2 or p54 (L2, 54)

Cont A	10 $\mu$ l 1101/1102/EcoRI (58)	+ nothing
Cont B	-----	+ 30 $\mu$ l carrier (308)
L2 A	-----	+ 30 $\mu$ l L2 (308)
L2 B	-----	+ 30 $\mu$ l L2 (308)
54 A	-----	+ 50 $\mu$ l 54 (258)
54 B	-----	+ 50 $\mu$ l 54 (258)

1 ml HEBS 2X + 1 ml H<sub>2</sub>O + 100  $\mu$ l CaCl<sub>2</sub>.

Cloning experiment 9 (9ex)

with new vectors

82 /  $\text{VGL} + \text{R1}$  (1)

82 /  $\text{R1} + \text{VGL}$  (2)

C vect 0.1/5 site ~ 10%

C insert 0.1/5 ~ 9%

9ex 1 - spl vect + spl insert

9ex 2 - spl vect + spl insert

February 20, Thursday

Analysis of  
restriction  
pattern of  
plasmids

1) ladder int.

2) 100% 1.0% 1.0% 1.0%

3) 100% 7

4) 54-1

5) 54-2

6) 54-3

7) 54-4

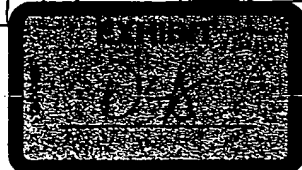
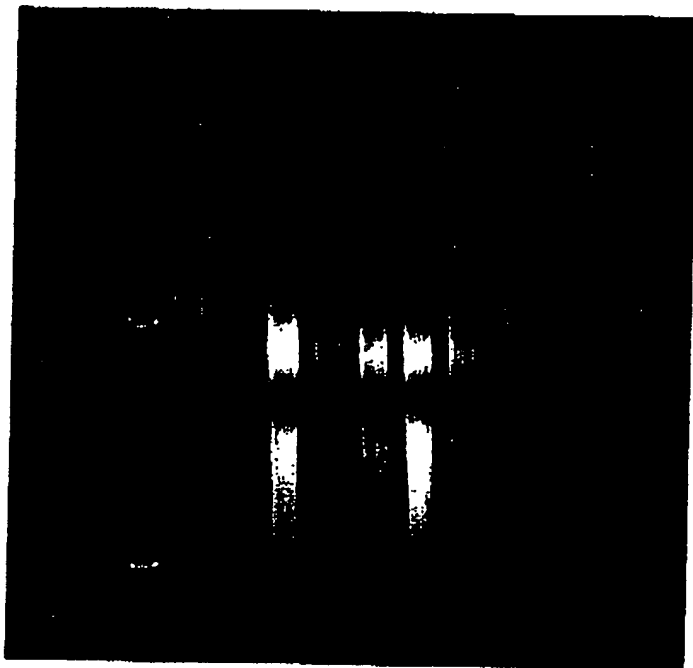
8) 54-5

100% 5+  
BamHI

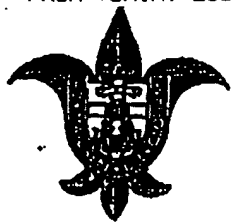
for 54-1  
54-3  
54-4

restriction pattern

is as expected for  
recombinant virus







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Department of Molecular  
Microbiology & Immunology

Health Sciences Center  
School of Medicine

**Facsimile Transmittal**

**Date:** 12 - 3 - 02

**From:** William Wold

**Phone:** 314-577-8432

**Fax:** 314-773-3403

**Deliver to:** Dan Kasten

**Phone:** \_\_\_\_\_

**Fax:** 552-76305

**Total number of pages including this page:** 12

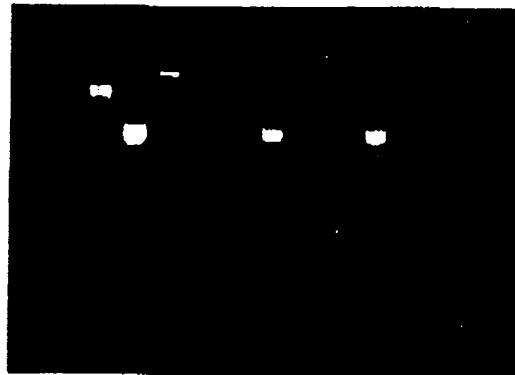
**Message:**

Kostya's lab notes.

KOI is made  
2/20/97

2-20-97

22-141 60 SHEETS  
22-142 100 SHEETS  
22-143 200 SHEETS



PCR of Kint pro  
from previous picture  
primers KOI 1 and KOI 7

- 1) ladder 1ul
- 2) pFG140 (.1250g)
- 3) pS4
- 4) water
- 5 - 9) -
- S4 1 - 5
- respectively

viruses S4-2  
and S4-5  
control both wt  
and recombinant + ADP

there is band as is wt in movie!

S4-1  
S4-3  
S4-4 } - recombinants!

02-25-97

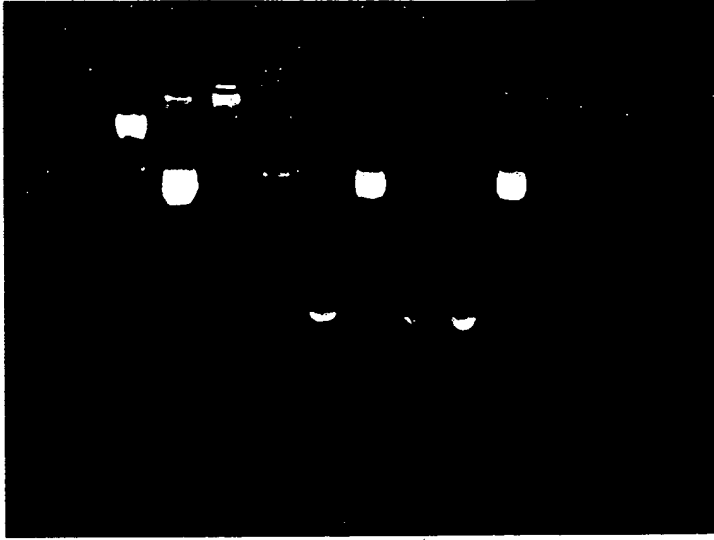
9ea. → 2 time purified then gel vector.  
p82 / R1 86.  
insert p31 / R1 86 } 1 fr.

vector 10ul 82 + 8ul H<sub>2</sub>O + 2ul buffer

vectorlig 10ul 82 + 8ul H<sub>2</sub>O + 2ul buffer + 4ul ligase

vector + insert 10ul 82 + 8ul insert + 2ul buffer + 1ul ligase

2.20.97



PCR of int frags  
from previous picture.  
primers 10D1 and 10D7.

- 1) ladder 1ul.
- 2) pCG140 (dl scg)
- 3) pS4
- 4) mock
- 5 - 9) -
- S4 1 - 5
- respectively.

viruses S4-2  
and S4-5  
contain both wt  
and recombinant ADP!

there is band as in wt in movie!

S4-1  
S4-3  
S4-4 } - recombinants!

S2-25-97

9ex. → 2 time purified then gel vector.  
p82 / R1 x62.  
insert p31 / R1 x62 } 11 fr.

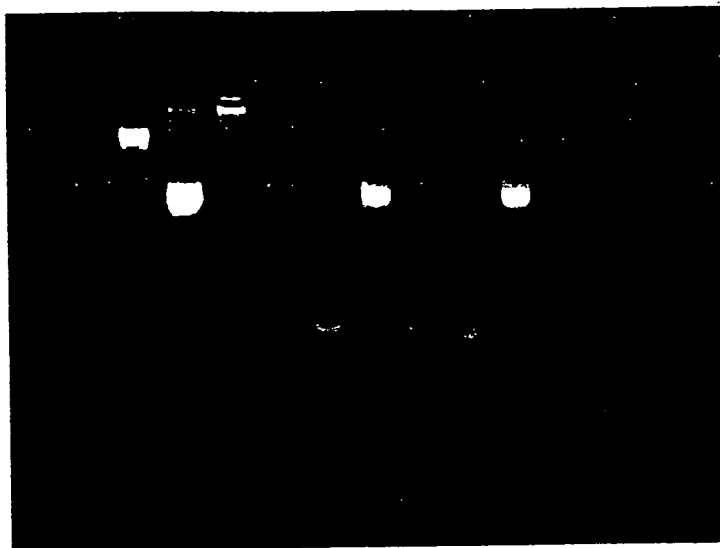
vector 10ul S2 + 8ul H<sub>2</sub>O + 2ul buffer

vector+lig 10ul S2 + 8ul H<sub>2</sub>O + 2ul buffer + 1ul ligase

vector+insert 10ul S2 + 8ul insert + 2ul buffer + 1ul ligase  
~~in 10ul S2~~

2-20-94

22-141 50 SHEETS  
22-142 100 SHEETS  
22-144 200 SHEETS



PCR of *Umt* frags  
from previous picture.  
primers 12D1 and 12D7.

- 1) ladder 1ul
- 2) pCG140 (dl 309)
- 3) p54
- 4) mock
- 5-9) -
- 54 1-5
- respectively.

viruses 54-2  
and 54-5  
contain both wt  
and recombinant ADP!

there is band as in wt in movie!

54-1  
54-3  
54-4 } - recombinants!

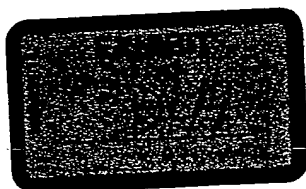
82-25-97

9ex. → 2 time purified then gel vector.  
p82 / R1 862.  
insert p31 / R1 862 } 1 fr.

vector 10  $\mu$ l 82 + 8  $\mu$ l H<sub>2</sub>O + 2  $\mu$ l buffer

vector + lig 10  $\mu$ l 82 + 8  $\mu$ l H<sub>2</sub>O + 2  $\mu$ l buffer + 7  $\mu$ l ligase

vector + insert 10  $\mu$ l 82 + 8  $\mu$ l insert + 2  $\mu$ l buffer + 1  $\mu$ l ligase  
~~and ligase~~



02-25-97

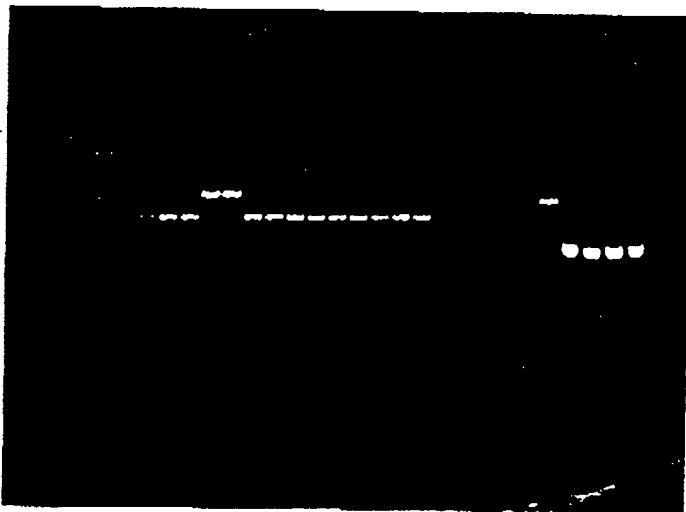
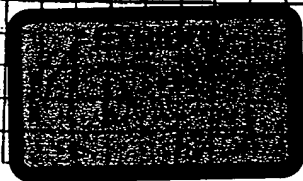
SL-10 plaques - phage type that I like  
 WT + ~~TEX~~ or rec with high MOI?

Sex - try 8m 16?

03-05-97 Wednesday

Clay Experiment 10 ex  $\Rightarrow$  pL2 + E3 from gp13K (p31)  
 (sites EcoRI + NdeI).

11 ex  $\Rightarrow$  pL2 + E3 from dPE3X66 + ADP  
 (p42)  
 (sites  $\Rightarrow$  EcoRI + NdeI).



PCR analysis  
 of plaques p82  
 and p54

1) Ladder

2) Blank

3) mock

4) 1101/1102

5) PF6/40

6) p225

7) p82

8) wt 1101/1102

9) 821

10) p23

11) 824

12) 826

13) 828

14) 829

15) 8210

16) 8211

primers

10, 11

17) Ladder

18) Blank

19) mock

20) 1101/1102

21) #40

22) 54

23) 546

24) 548

25) 549

26) 5410

primers

1, 4, 5

p82 + 11/21/1107/8081 plaques!

AC wt 1 - medium size } wt control

AC wt 2 - large size

transfection  
from 01-25

A. 1, 2 - medium

B. 3 - medium

➤ 4 - small

5 - medium

B. 6, 7, 8 - medium

➤ 9 - small

C. 10 - medium

➤ 11 - small

(12, 13, 14) - medium } plaques?  
(15, 16, 17) - medium } or not.

transfection  
from 02-02

➤ Plasmid contamination in plate wells

827 ➤ lost due to breakage of Eppendorf  
and 547 tubes.

⇒ recombinants with p82 according to PCR results.  
p54 = ? ⇒ no product of PCR, just RNA.

50 SHEETS  
100 SHEETS  
200 SHEETS

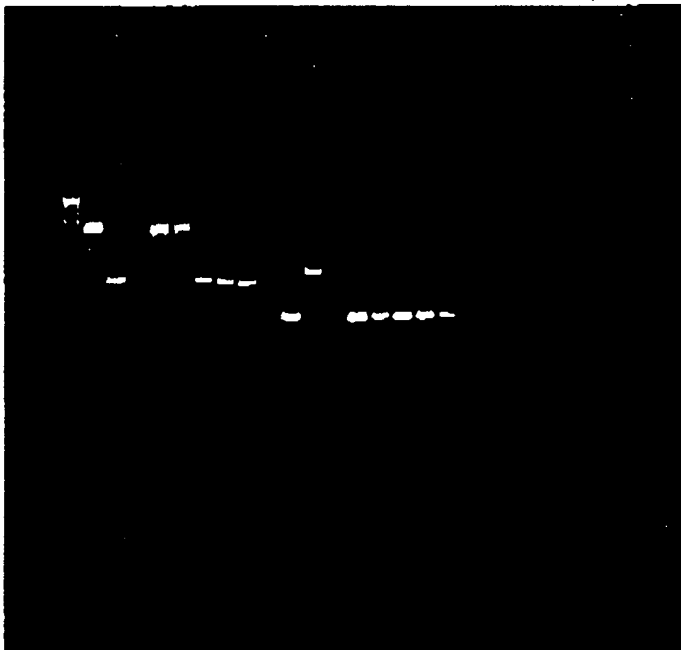


05-06-97

Ligation 10 ex, 11 ex.

5  $\mu$ l vector (L2/ENAH)  $\rightarrow$  V+ ligase  $\rightarrow$  VL+ 10  $\mu$ l 5' ENL  $\rightarrow$  10ex L+ 15  $\mu$ l 3' ENL  $\rightarrow$  10ex H+ 15  $\mu$ l 4' EN  $\rightarrow$  11ex

PCR Analysis of plaques



1) ladder

2) 140

3) 54

4) mock

5) WT 1101/1102

6) 546

7) 548

8) 540

9) 5400

10) blank

11) blank

12) p82

13) mock

14) WT 1101/1102

15) 822

16) 825

17) 827

18) 829

primers  
40, 1, 7.primers  
10, 11.

548, 549, 5410

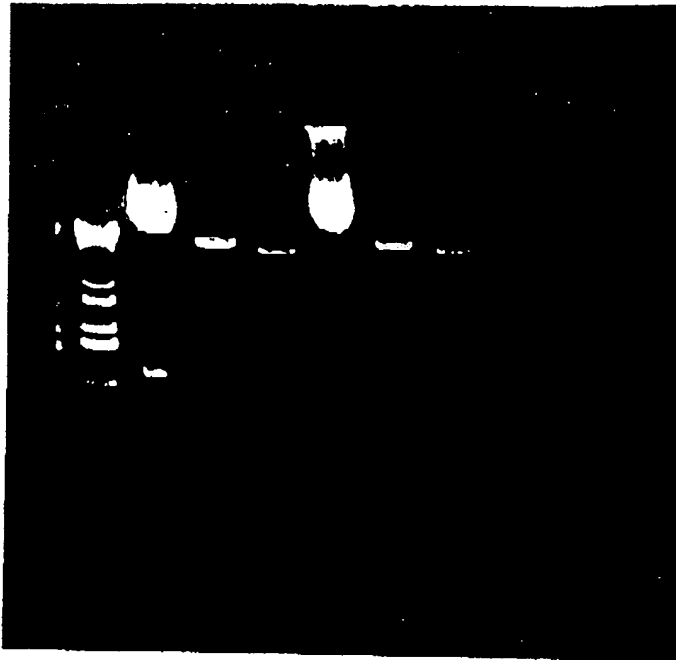
- recombinants

with p82 all

plaques are wt.



22-141 50 SHEETS  
22-142 100 SHEETS  
22-144 200 SHEETS



- 1) Ladder
  - 2) pL2
  - 3) p31
  - 4) p42
  - 5) pL2
  - 6) p31
  - 7) p42
- { EcoRI +  
 Nde,  
 buffer NE  
 { EcoRI +  
 + Nde,  
 buffer )

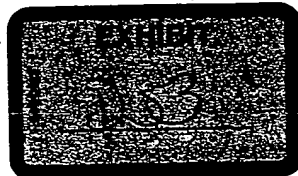
03-01-97

Transfection p82 into 293/TTR.

12 dishes — 6 - control (sal of precip) — 60% DNA  
 6 - experiment ( — )

(control) 25  $\mu$ l 1101/1107/R1 (5r) — 1.5 ml LIEBS 2X  
 + 5  $\mu$ l pcw TTR (10x) 1.5 ml H<sub>2</sub>O  
 + 30  $\mu$ l buffer. (~300) 150  $\mu$ l each  
 DNA.

(exper. p82) 25  $\mu$ l viral DNA  
 + 5  $\mu$ l pcw TTR  
 + 30  $\mu$ l p82





03410 - 97

Cloning 10 ex, 11 ex.

1 - ladder

2 - p12 7

3 - p31

4 - p42

5 - 10L-1

6 - 10L-2

7 - 10L-3

8 - 10L-4

9 - 10L-5

10 - 10L-6

11 - 10L-7

12 - 10H-1

13 - 10H-2

14 - 10H-4

15 - 10H-5

16 - 10H-6

17 - 10H-7

18 - 10H-8

19 - 11-1

20 - 11-2

21 - 11-3

22 - 11-4

23 - 11-5

24 - 11-6

25 - 11-7

26 - 11-8



11 - all clones - rec 11

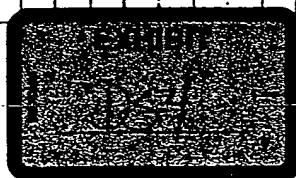
10H - all clones - rec 10H

lower band was visible in  
all clones in short run

type 11 and 10H

for cell prep.

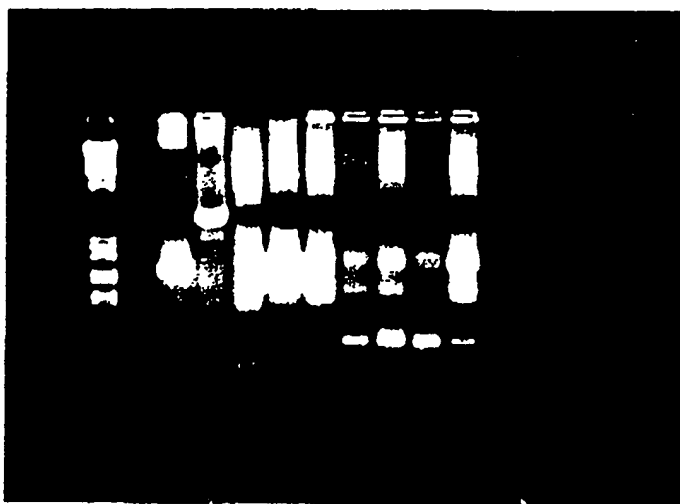
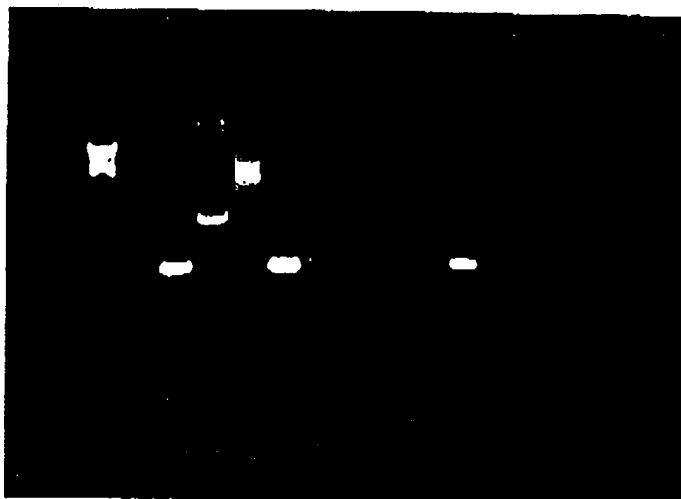
Enrich + Nde I



03-12-97

first traps of small amount (plate) of 293/TRE  
 infected with slow growing viruses p82(?)  
 PCR, primers 10, 11.

50 SHEETS  
 22-141 100 SHEETS  
 22-142 100 SHEETS  
 22-143 100 SHEETS



- 1) ladder.
- 2) blank (H<sub>2</sub>O)
- 3) p82100.
- 4) p82
- 5) mock.
- 6) wt.
- 7) 8212
- 8) 8214
- 9) 8215
- 10) 8216
- 11) 82-17

Conclusions:

Blank - clean.

in 82-12, 82-17 -  
 band, corresponding to wt.  
 and weak additional  
 band corresp. to p82.

(does not present in wt!!!)  
 something of a bit smaller  
 than present in mock

3-17-97

PCR analysis of p82 resulting plaques &amp; primers

UD 8, UD 9 -

- S.P.B. - promoter  
specific.

- 1) ladder
- 2) blank
- 3) pFG140
- 4) p82
- 5) mock
- 6) wt 1.04/1.10x
- 7) 821
- 8) 822
- 9) 823
- 10) 824
- 11) 825
- 12) 826
- 13) 827
- 14) 828
- 15) 829
- 16) 8210
- 17) 8211
- 18) 8212
- 19) 8214
- 20) 8215
- 21) 8216
- 22) 8217

On cloning, there is SPB & 293 cells,  
vectors are rather w/ than,  
recombinants, need to use

(UD 8, UD 11) combination of primers / UD - SPB specific

3-18-97

Sequencing

KD 9 (p21, primer KD10)

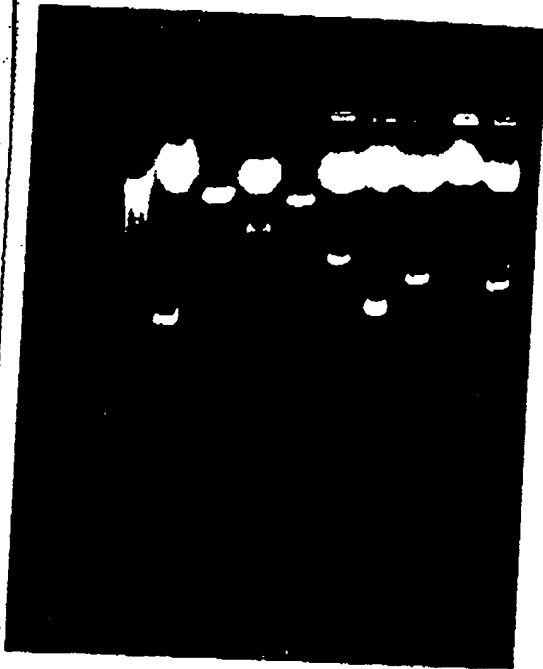
KD10 (p21, primer KD11)

KD11 (p111, primer KD4)

KD12 (p111, primer KD5)

50 SHEETS  
100 SHEETS  
200 SHEETS

Restriction pattern of Csl frags. of p101, p111



- 1) 1 kb ladder
- 2) L2 / R1 + NdeI
- 3) p31 / R1 + NdeI
- 4) p101 / R1 + NdeI
- 5) p42 / R1 + NdeI
- 6) p111 / R1 + NdeI
- 7) L2 / PacI + SpeI
- 8) p101 / PacI + SpeI
- 9) L2 / SpeI + XbaI
- 10) p111 / SpeI + XbaI

3-21-97

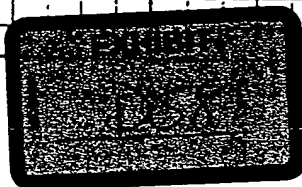
Analysis of sequences KD 9, 10, 11, 12.

Everything is fine with p111. As predicted.

p21 - sequence with all primer is fine.

- sequence with KD10 primed shows that the  
 E. coli sequence is going after AA nt 35858 and  
 up to the end of sequence (approx 600 bp) → see

⇒ p626 and p82 are not responsible for virus  
Need to check p8611 for the same mutation.

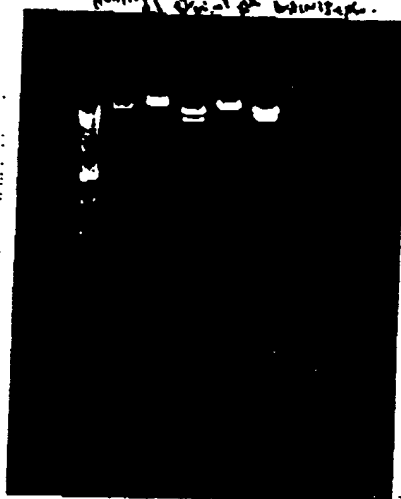


akes K03  
3/27/97

3-20-97 Regues. (experiments of 02/05-02/02)  
626M 1-12 (12)  
626c 1-6 (6)  
11M 1-4 (4)

3-25-97

25-141 50 SHEETS  
25-142 100 SHEETS  
25-144 200 SHEETS



1) Collier 1KB

buffer-ME

2) 1101/1107 DNA / ScaRI - SpeI

3) p82

4) p82 / Bst 1107 I

5) p82 / XbaI

6) p82 / Bst 1107 I + XbaI

There is Bst 1107 I site at 29012!

2nd is after ScaB promoter

3-27-97

Transfection 293 with p101, p111 + 1101/1107 / ScaRI + SpeI  
8X Gen dishes.

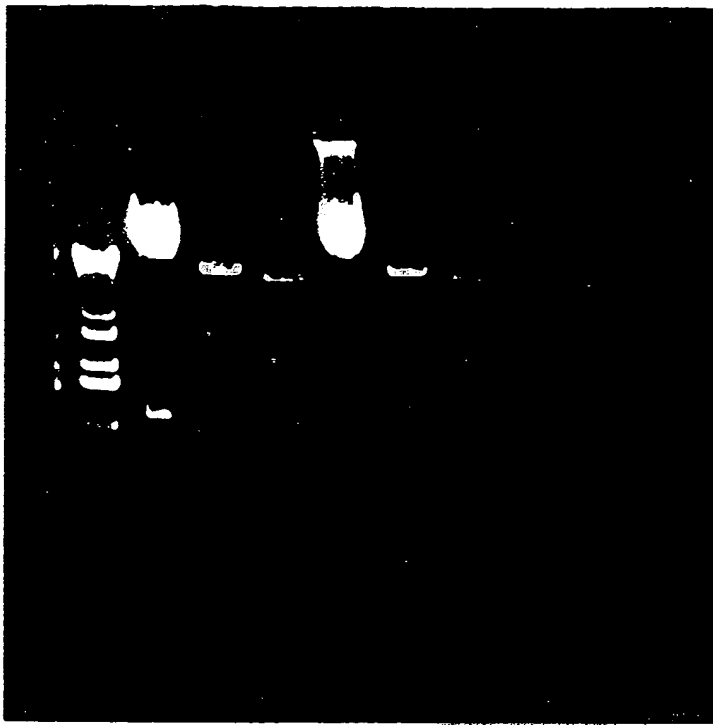
3 dishes 101 (for 1 dish) 200  $\mu$ l MEME 2X + 200  $\mu$ l H<sub>2</sub>O + 10  $\mu$ l 101

3 dishes 111 (for 1 dish) 200  $\mu$ l MEME 2X + 200  $\mu$ l H<sub>2</sub>O + 10  $\mu$ l 111

2 dishes control (for 1 dish) 200  $\mu$ l MEME 2X + 200  $\mu$ l H<sub>2</sub>O

+ 10  $\mu$ l 1101/1107 + 25  $\mu$ l GCE<sub>2</sub>.





- 1) Ladder
  - 2) pL2
  - 3) p31
  - 4) p42
  - 5) pL2
  - 6) p31
  - 7) p42
- { EcoRI +  
 Nde,  
 buffer ME  
 { EcoRI +  
 + Nde,  
 buffer D

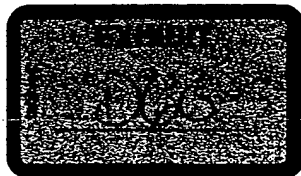
03-07-97

Transfection p82 into 293/TTR.

12 dishes — 6 - control (3 ml of precip.) — 600 DNA  
 6 - experiment ( — — — — — ) — — — — —

(control) 25 µl 1101/1107/R1 (50)  
 + 5 µl penicillin (100)  
 + 30 µl buffer. (~300) 1.5 ml LIEBS 2X  
 1.5 ml H<sub>2</sub>O.  
 150 µl CaCl<sub>2</sub>

(control p82) 25 µl viral DNA.  
 + 5 µl penicillin  
 + 30 µl p82



034 10 - 97

Cloning 10 exp, 11 ex.

1 - Cadder

2 - p12 7

3 - p31

4 - p42

5 - 10L-1

6 - 10L-2

7 - 10L-3

8 - 10L-4

9 - 10L-5

10 - 10L-6

11 - 10L-7

12 - 10H-1

13 - 10H-2

14 - 10H-4

15 - 10H-5

16 - 10H-6

17 - 10H-7

18 - 10H-8

19 - 11-1

20 - 11-2

21 - 11-3

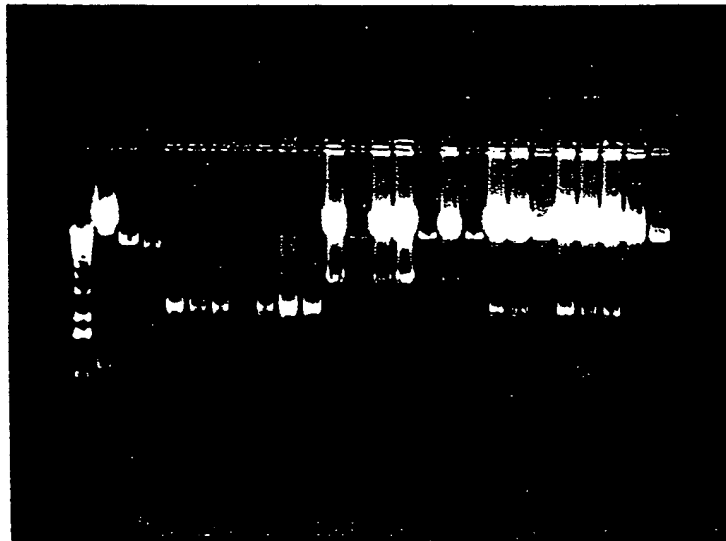
22 - 11-4

23 - 11-5

24 - 11-6

25 - 11-7

26 - 11-8

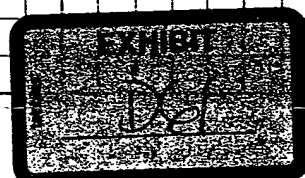


19 - all clones - rect 12

10H - all clones - record book  
lower band was visible in  
all clones in short run.

take 11 and 101  
for cell prep.

Exobi + Met

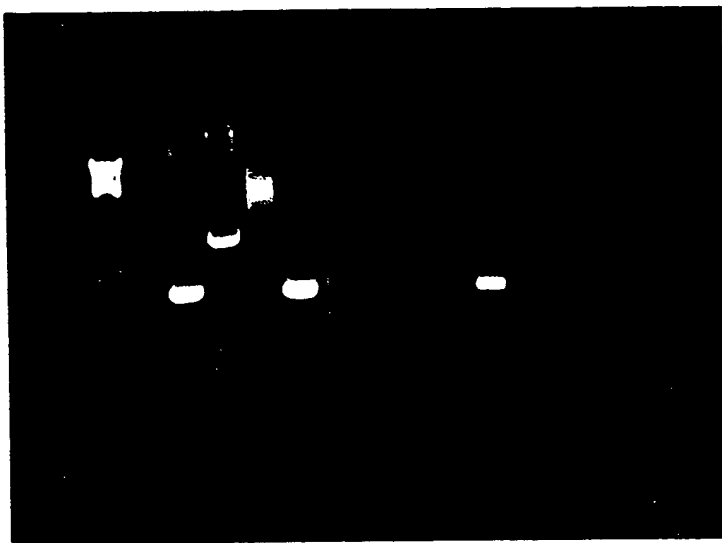




03-12-97

First maps of small amount (plate) of 293/TTF  
infected with slow growing viruses p82(?).  
PCR, primers 10, 11.

- 1) ladder.
- 2) blank (H<sub>2</sub>O)
- 3) pF6140.
- 4) p82
- 5) mock.
- 6) wt.
- 7) 8212
- 8) 8214
- 9) 8215
- 10) 8216
- 11) 82-17.

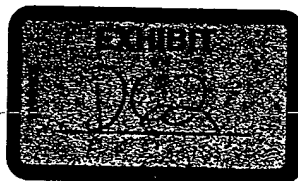
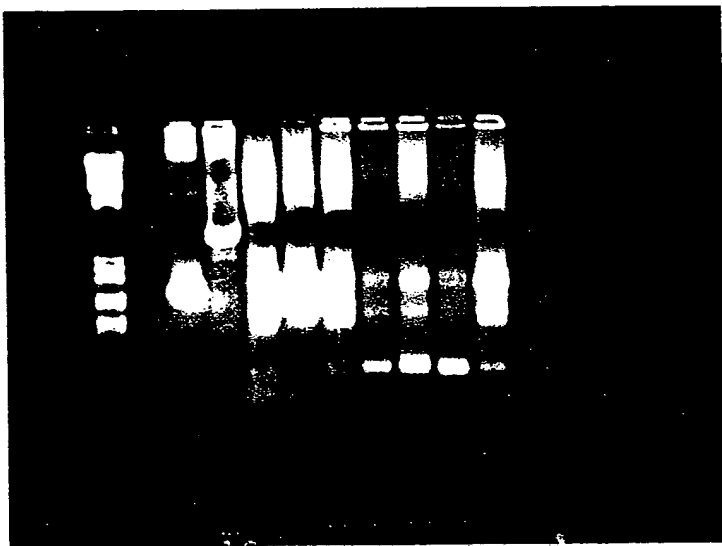


Conclusions:

Blank - clean.

In 82-12, 82-17 -  
band, corresponding to wt.  
and weak additional  
band corresp. to rec.

(does not present in mock!!!)  
Something of a bit smaller  
MW present in mock



3-17-97

PCR analysis of p82 resulting plaques (primers

4) 8, 4) 9 -

- SPB - promoter  
specific).

1) larder.

2) blank.

3) pF6140.

4) p82

5) mock.

6) wt 1.04/1.10x

7) 821

8) 822

9) 823

10) 824

11) 825

12) 826

13) 827

14) 828

15) 829

16) 8210

17) 8211

18) 8212

19) 8214

20) 8215

21) 8216

22) 8217

Conclusion: there is SPB in 293 cells,  
viruses are rather wt than  
recombinants. need to use

(12) 8, (11) combination of primers (9 - SPB specific)  
(11 - AI specific)

3-18-97

### Sequencing

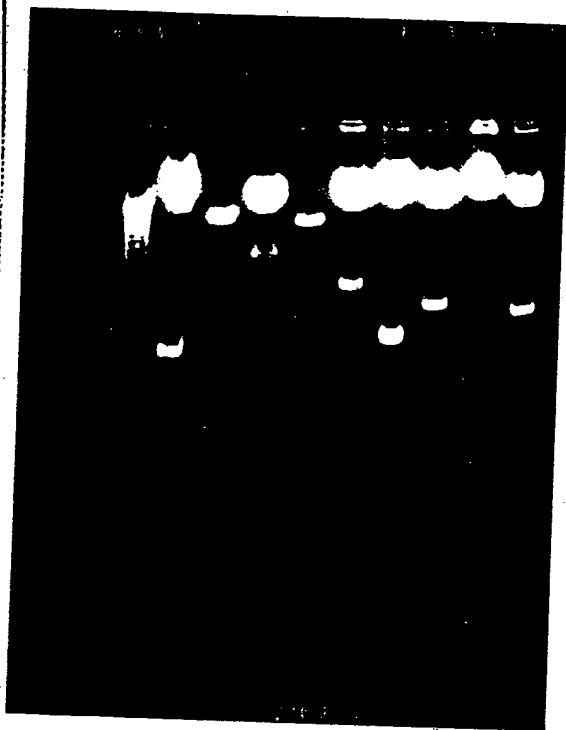
KD9 (p21, primer KD10)

KD10 (p21, primer KD11)

KD11 (p111, primer KD4)

KD12 (p111, primer KD5)

Restriction pattern of Csl preps. of p101, p111.



- 1) 1 kb ladder
- 2) L2 / R1 + NdeI
- 3) p31 / R1 + NdeI
- 4) p101 / R1 + NdeI
- 5) p42 / R1 + NdeI
- 6) p111 / R1 + NdeI
- 7) L2 / PaeI + SpeI
- 8) p101 / PaeI + SpeI
- 9) L2 / SpeI + XbaI
- 10) p111 / SpeI + XbaI

3-21-97

Analysis of sequences KD9, 10, 11, 12.

Everything is fine with p111. As predicted.

p21 - sequence with all primer is fine.

- sequence with KD10 primer shows that the *E. coli* sequence is going after Ad nt 35858 and up to the end of sequence (~500 bp).  $\rightarrow$  see next page

⇒ p626 and p882 are not responsible for virus  
Need to check p84611 for the same mutation.

3-20-97 Pages. (experiments of 02/05  
02/02)

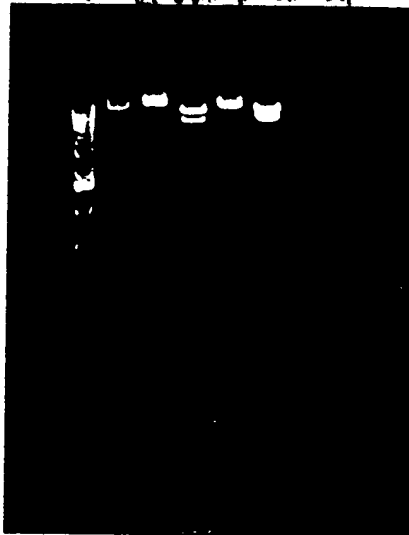
626M 1-12 (12)

626C 1-6 (6)

11M 1-4 (4)

3-25-97

22-141 50 SHEETS  
22-142 100 SHEETS  
22-144 200 SHEETS



1) ladder 1kb

buffer-ME.

2) 1101/1107 DNA / EcoRI + SpeI

3) p82

4) p82 / Bst 1107 I

5) p82 / XbaI

6) p82 / Bst 1107 I + XbaI.

There is Bst 1107 I site in p82  
at At 29012!

2nd is after SPB promoter!

3-27-97

Transfection 293 with p101, p111 + 1101/1107 / EcoRI + SpeI  
8X6cm dishes.

3 dishes 101 (for 1 dish) 200  $\mu$ l NEBS 2X + 200  $\mu$ l H<sub>2</sub>O + 10  $\mu$ l 101  
3 dishes 111 (for 1 dish) 200  $\mu$ l NEBS 2X + 200  $\mu$ l H<sub>2</sub>O + 10  $\mu$ l 111  
2 dishes control (for 1 dish) 200  $\mu$ l NEBS 2X + 200  $\mu$ l H<sub>2</sub>O

+ 10  $\mu$ l 1101/1107 + 25  $\mu$ l GCl<sub>2</sub>.



22-141 50 SHEETS  
22-142 100 SHEETS  
22-144 200 SHEETS



4/7/97

Plaque assay of 544 on 253

day  
16

309 - ( $\sim 2$ ) - plaques are confluent (no many plaques per dish)  
(cell stuck)

1101/1107 ( $\sim 2$ ) - Same as with 309.  
(cell and crude ligase)

544 (titer  $\sim 2$  is about  $\sim 2$  orders of magnitude lower than in wt/309, 101, plaques appeared  $\sim 1$  day later than in wt ( $\sim$  day 5) and are a bit smaller.

(day 16 size  $\sim 8$  mm)

7001: (cell) (titer is 1-2 orders  $\sim 2$  at m. lower than predicted for wt) plaques are tiny (day 16  $\sim 1-2$  mm diameter)

4/8/97

Ligation

12 ex 1) 82 (10  $\mu$ l) + Pst protot 17R (10  $\mu$ l)  
Bst (part) + K69 from 140 (49 (6,7))

2) 87 (5  $\mu$ l) +

4/16/97

Ligation (2 ex: vector 87/K69 + Bst (part) + CIP  
82/K69 + Bst (part) + CIP  
upper fragment.  
82/K69 + Bst + CIP  
lower fragment

4/17/97 Sequencing

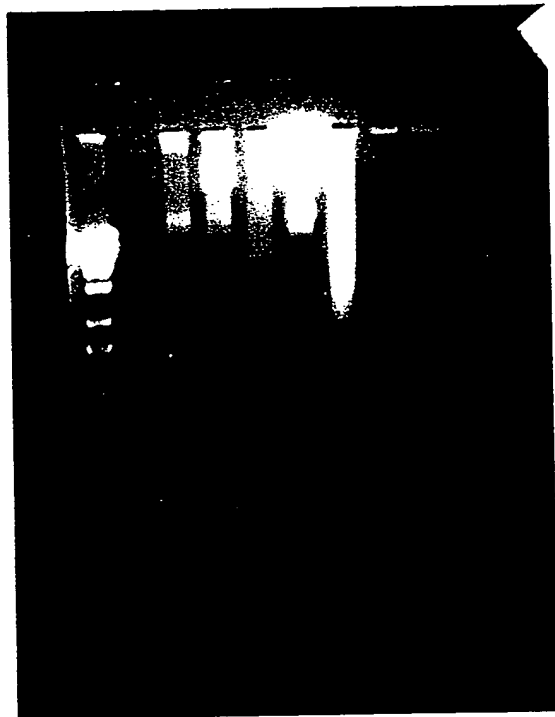
u) (14) - (pB4611, primer KD10)

u) (15) - (pB4610, primer KD10)

u) (16) - Nippon's Gel & large plasmid, primer KD16

u) (17) - p82, primer KD10

u) (18) - p111, primer KD10.



that maps of 101-1  
and 111-1,

PCR, primers 1,5.

1) ladder.

2) blank

3) pB6140.

4) p101

5) 101-1

6) p111

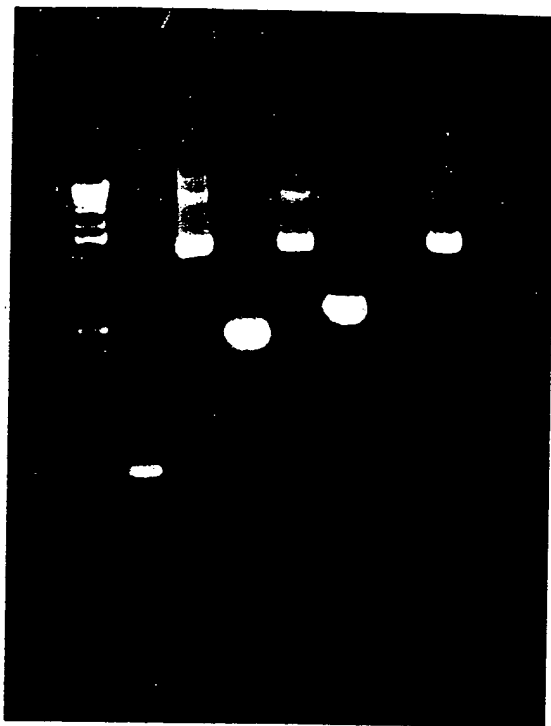
7) 111-1

p101, p111 <sup>(111-1)</sup> PCR didn't  
work.

for 101-1 product is  
as expected for 111

Mixed tubes 101-1, 111-1  $\Rightarrow$  or what?

22-141 50 SHEETS  
22-142 100 SHEETS  
22-144 200 SHEETS



PCR primers 1, 7.

- 1) Ladder
- 2) Blank
- 3) 140.
- 4) 54
- 5) p101
- 6) p111.
- 7) 101-1
- 8) 111-1.

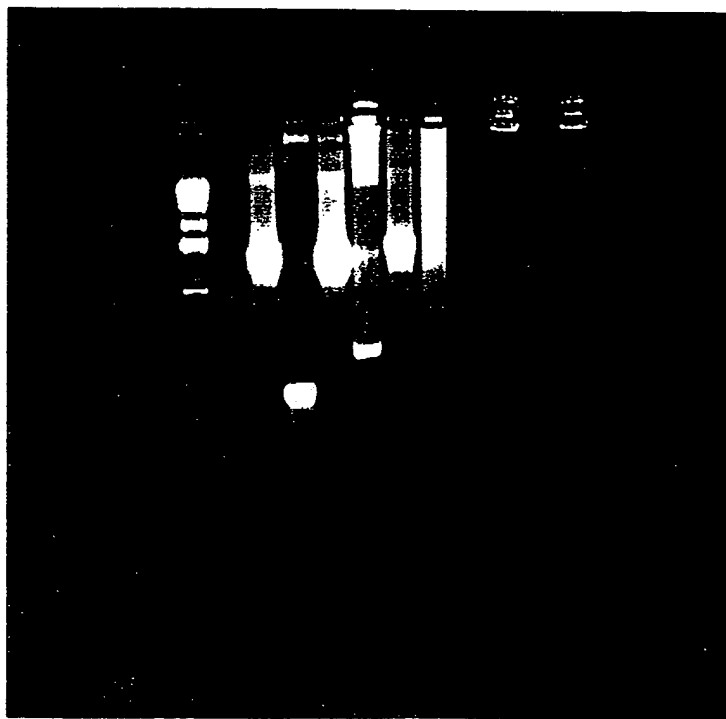
in 111-1 band is as h wt  
(or 101)

in 101-1 band is higher  
than wt.

4/21/97

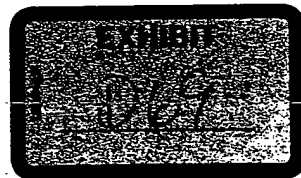
PCR, primers 1, 7.

- 1) Ladder.
- 2) Blank
- 3) p140.
- 4) p54
- 5) p101
- 6) p111
- 7) 101-1
- 8) 111-1.



Conclusion:  
this time everything  
is as expected.

- |           |           |
|-----------|-----------|
| 9) 101-2  | } plogus. |
| 10) 111-3 |           |
| 11) 111-4 |           |
| 12) 101-1 |           |





1/22

## Sequencing

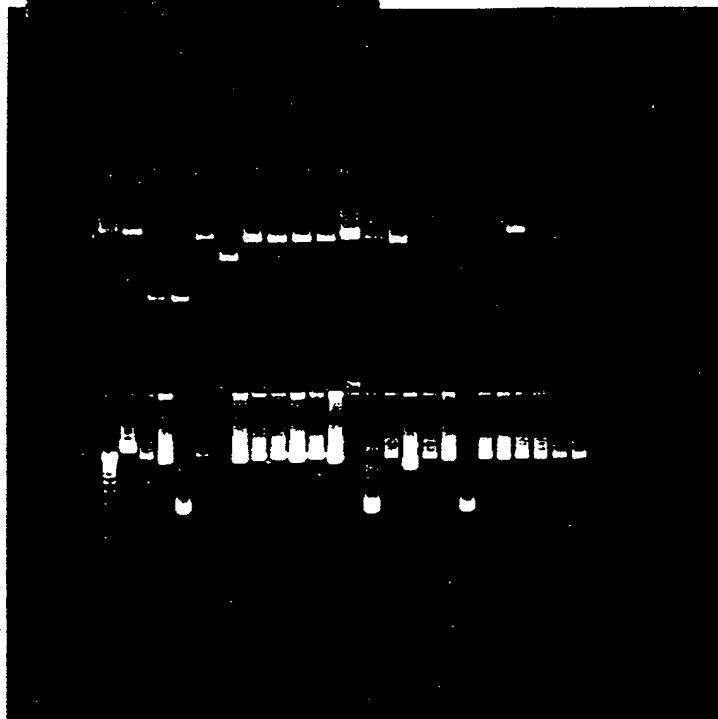
- WJ 19 - Chip's pED vector, primer LFC II 6
- WJ 20 - pB4G10, primer KD10.
- WJ 21 - p82, primer WJ 16
- WJ 22 - p82, primer WJ 17
- WJ 23 - p21, primer WJ 16
- WJ 24 - p21, primer WJ 17

## Results of previous sequencing:

- WJ 14 (pB4G11, primer KD10) - sequence terminates on same point where two sequences start in p21.
- WJ 15 (pB4G10, primer WJ 16) - same as ↑  
primer KD16
- WJ 16 (Mippers large GAL4 plasmid) - same as ↑  
but there is some sequence which is what?
- WJ 17 (p82, primer WJ 10) - sequence of 30-50 primer, need to repeat with WJ 16 primer.
- WJ 18 (p111, primer WJ 10) - sequence is perfect as predicted!

Sequences 19-24 - early termination everywhere  
⇒ new protocol doesn't work.

22-141 50 SHEETS  
22-142 100 SHEETS  
22-144 200 SHEETS



minipreps of 12 ex.

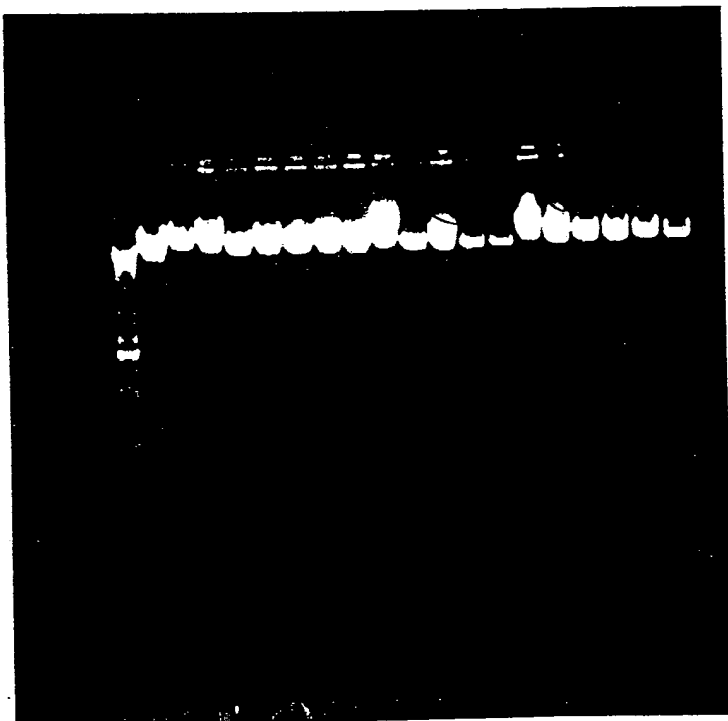
- 1) Ladder,
- 2) p82
- 3) 87-1
- 4) 87-2
- 5) 87-3
- 6) 82uex1(1-9)
- 7) 82uex2(1-12)
- 8) ↓
- 9) ↓

- 1) Ladder.
- 2) p82.
- 3) 82Lex1(1-12)
- 4) ↓ 82Lex2(1-12)

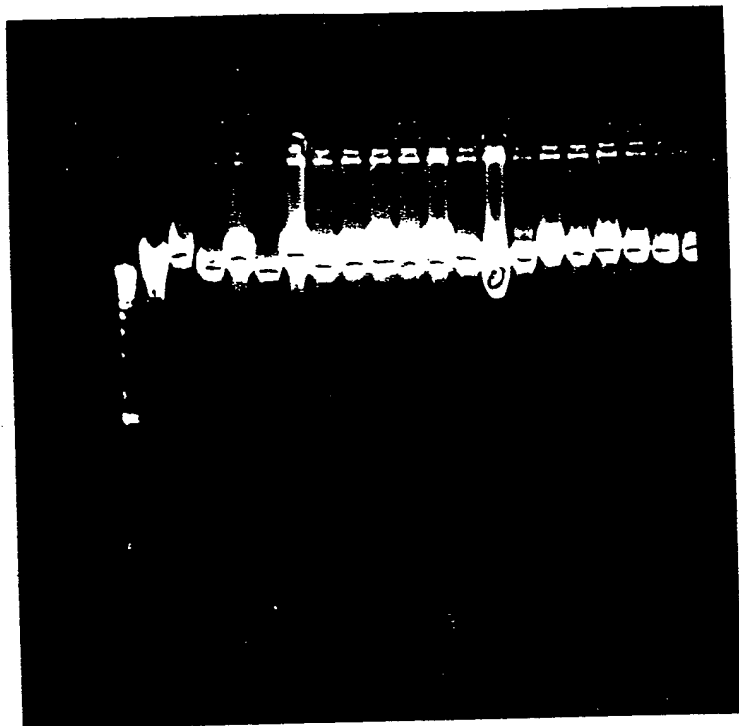
4/23 Restriction analysis of clones 12 ex

- 9 Ladder
- 1) p82 / R1
- 2) p82 / X63
- 3) 87 1
- 4) 82 41
- 5) 82 41-3
- 6) 82 41-4
- 7) 82 41-5
- 8) 82 41-6
- 9) 82 41-7
- 10) 82 41-8
- 11) 82 41-9
- 12) 82 41-10
- 13) 82 41-11
- 14) 82 41-12
- 15) 82 41-13
- 16) 82 41-14
- 17) 82 41-15
- 18) 82 41-16
- 19) 82 41-17
- 20) 82 41-18

EcoRI



Conclusions: 82 / R1 - partial digestion.  
clones - no small bands.  
2 possibly recombinants.  
Marked bands have lower MW than p82 / X63



- 1) ladder
- 2) p82/r1
- 3) p82/Xba
- 4) L1-1
- 5) L1-2
- 6) L1-4
- 7) L1-5
- 8) L1-7
- 9) L1-8
- 10) L1-9
- 11) L1-10
- 12) L1-11
- 13) L2-2
- 14) L2-3
- 15) L2-4
- 16) L2-5
- 17) L2-7
- 18) L2-8
- 19) L2-9
- 20) L2-10
- 21) L2-11
- 22) L2-12

Conclusion: p82 - partial digestion  
 clones - no small bands.

L2-3 - exclude from further analysis.

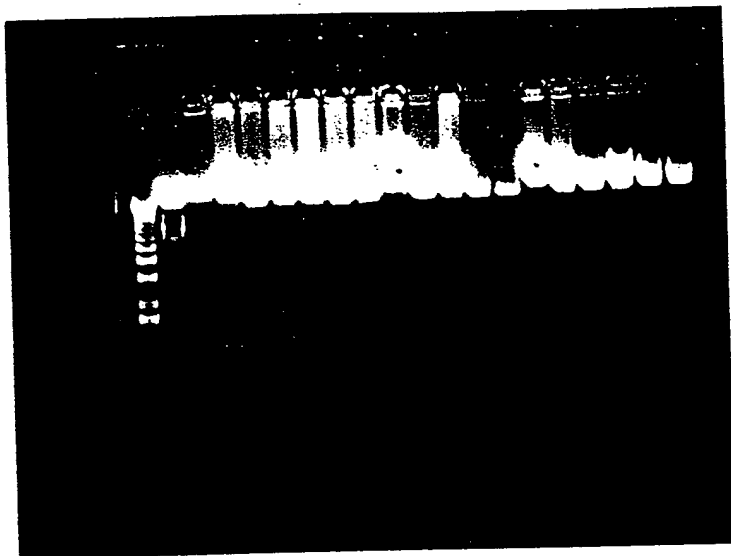
Tag NdeI - XbaI hybrid digestion.

correct 5 kb fragment in rec;  
 6 kb fragment in p2 (out)

4/29

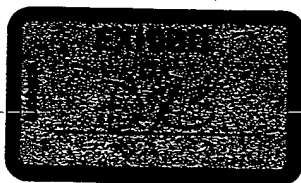
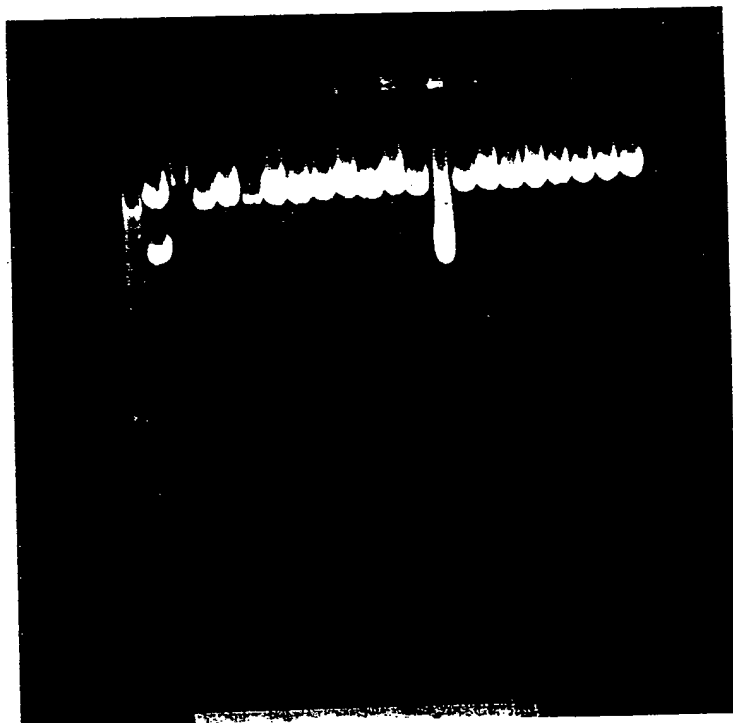
Same as previous 2  
pictures,

- 1) ladder
  - 2) p82 / x6 + vde
  - 3) p82 / vde.
  - 4) clones / x6 + vde
- ↓

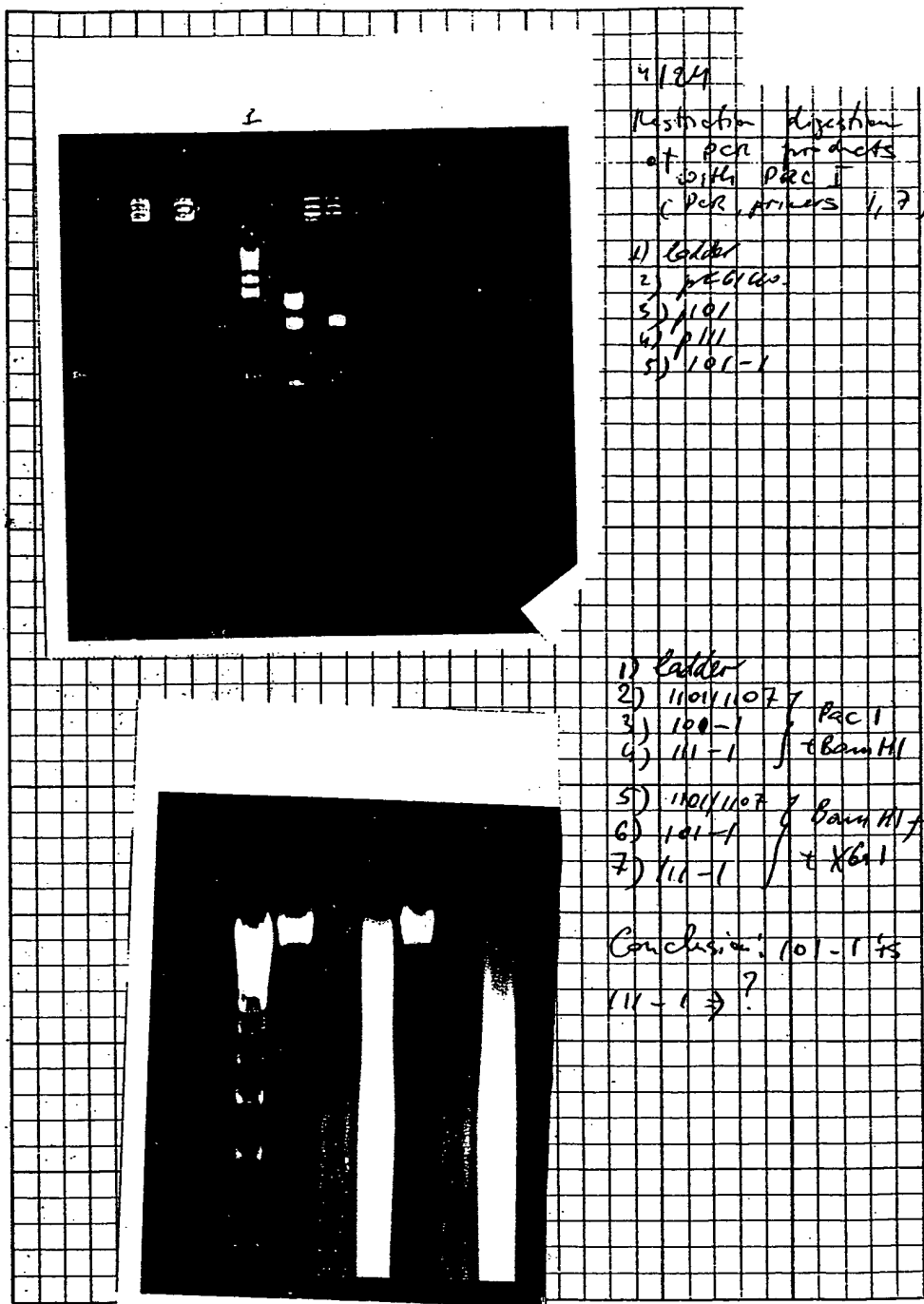


Conclusion of all these  
clones are junk,  
start cloning at 192  
into 223 where Bst<sub>III</sub>  
is unique, then put  
into resulting plasmid  
ben-vde fragment from  
pRG140 (uniqueness  
again).

Probably, most of them  
are dt Bst - Bst clones!  
But where is vector  
background?



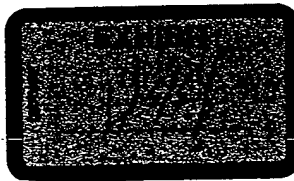
WDZ is made  
4/24/97



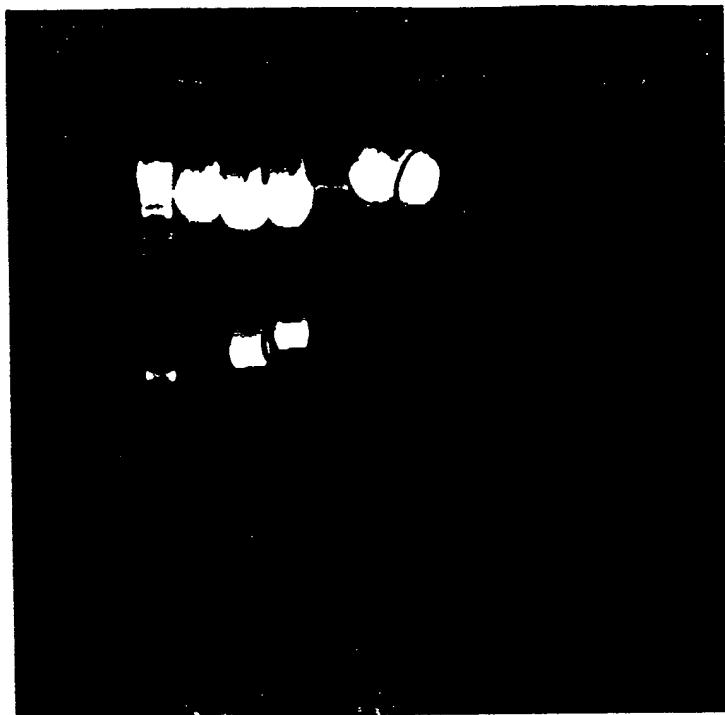
4/24/97  
Restriction digestion  
of PCR products  
with Pst I  
(PCR primers 1, 2)

1) Ladder  
2) 1101/1107 Pst I  
3) 100-1 Bam HI  
4) 111-1 Bam HI  
5) 1101/1107 Bam HI  
6) 101-1 Xba I  
7) 111-1 Xba I

Conclusion: 101-1 is Pst.  
111-1 ?

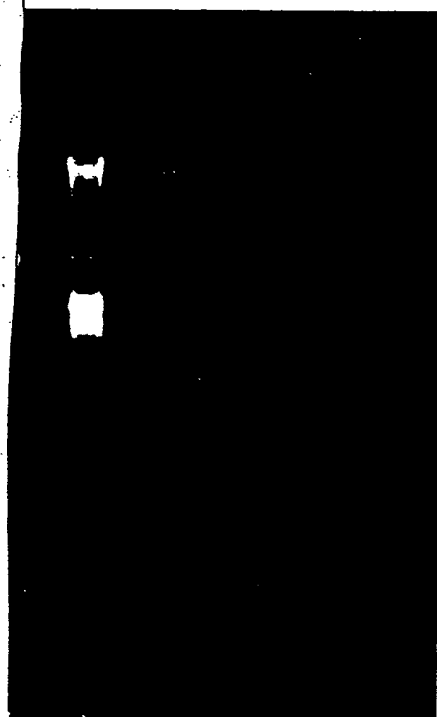


22-141 50 SHEETS  
22-142 100 SHEETS  
22-144 200 SHEETS



4126.

- 1) ladder
- 2) p~~CR~~II/gp19u~~ds~~7 (Ferry) / ~~4~~sp~~4~~ / ~~KI~~
- 3) ~~—————~~
- 4) ~~—————~~ Bam + X6
- 5) pC1/gp19u (Ferry) / Eco RI
- 6) pEDMAS / Eco RI
- 7) pEDMAS / Bam + X6.



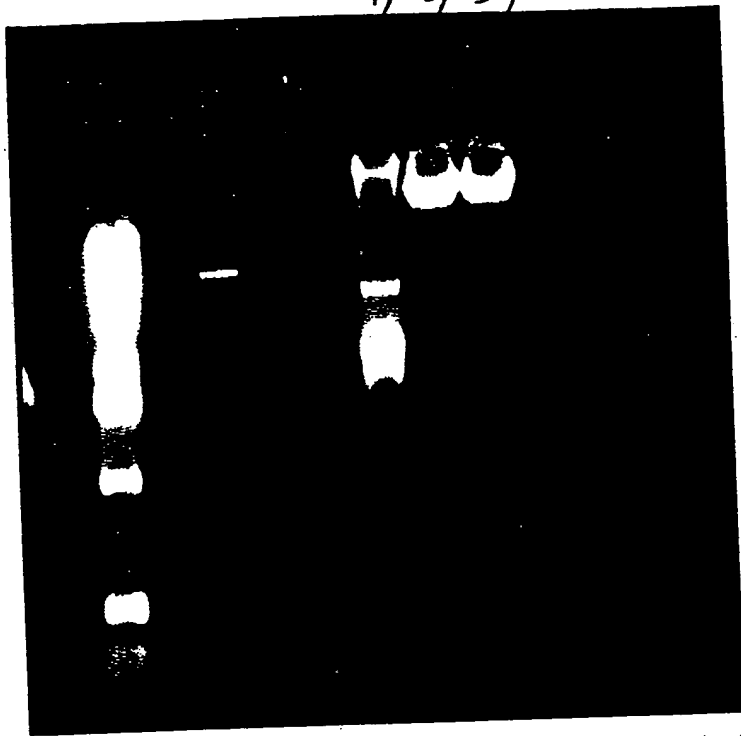
- 1) Ladder
- 2) gp19u~~ds~~ Bam-X6 fr.
- 3) pEDMAS Bam-X6 vector.

Ligation:

- 1) vector 5 $\mu$
- 2) vector lig 5 $\mu$
- 3) vector + insert  
5 $\mu$  5 $\mu$



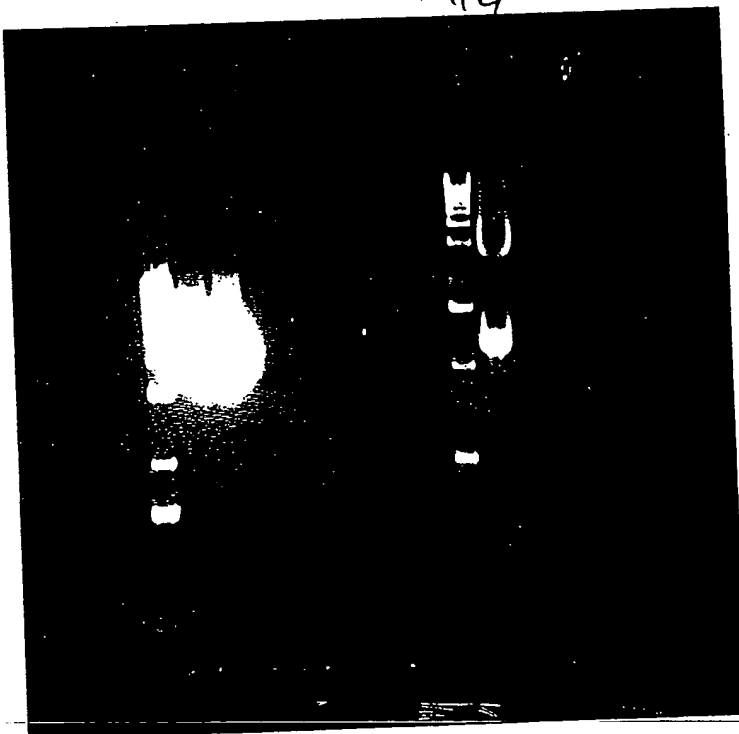
1) 2) 3)



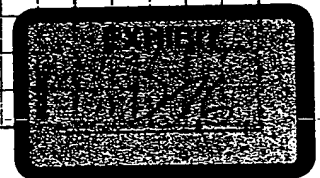
1) colder  
2) PCR 18p194 and 5/Bent +  
3) - - - - - 8st11071  
/ Ast 110714  
X62  
If doesn't  
look like ABS 7p194.  
check with Pst I  
check with Terry!

4/27

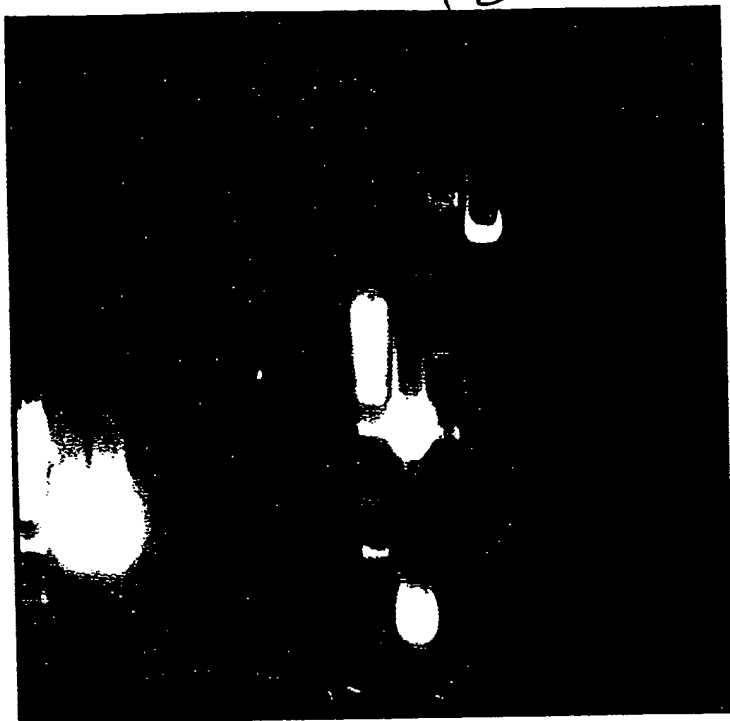
1) 124



1) colder  
2) PCR 18p194 and 5/Pst  
there is small  
fragment!  
this is 112 8p is a  
in reverse orientation!?  
check with Vin 14



22-141 50 SHEETS  
22-142 100 SHEETS  
22-144 200 SHEETS



4/28.

1) ladder.

2) pccu / 8p14k / HindIII

~ 500 bp fragment?

4/28.

PC1 / 8p19k

restriction digestion

1) ladder

2) pcc1 / 8p14k

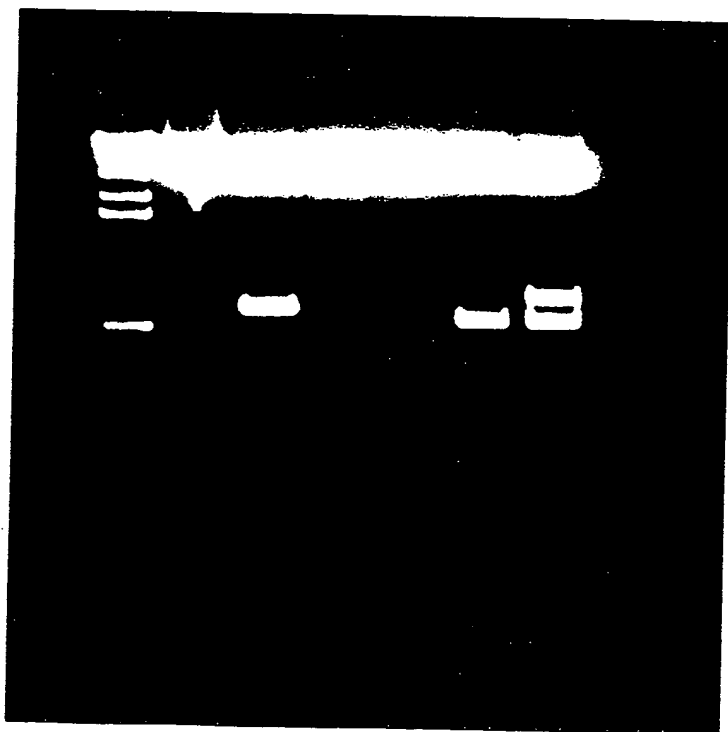
3) ——— / EcoRI

4) ——— / KpnI

5) ——— / PstI

6) ——— / HindIII

7) ——— / HindIII  
BamHI

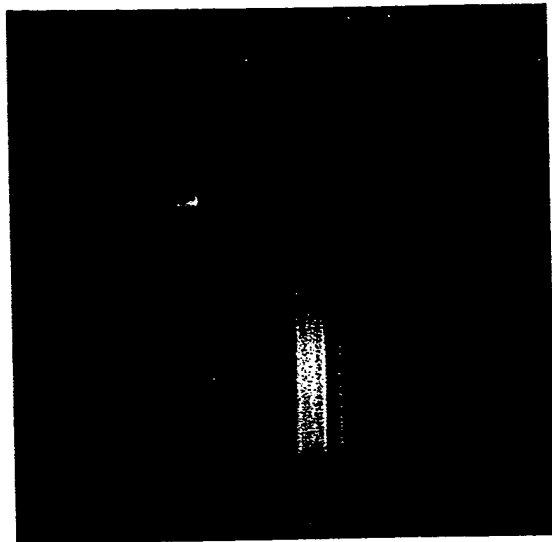




4/30/97

4/28/97

Restriction digestion of 111 plagues

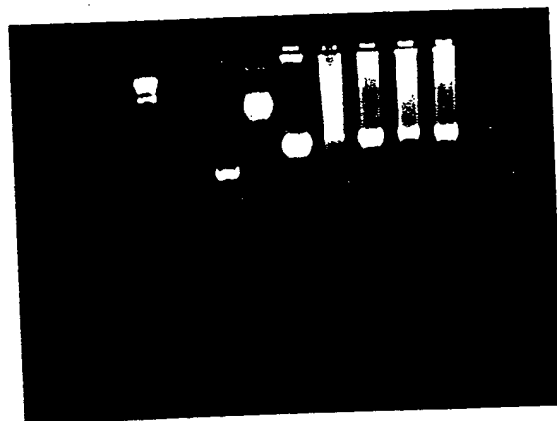


- 1) ladder
  - 2) 1101/1102 DNA
  - 3) 111-1 (new prep) Bam HI
  - 4) 111-2 Xba
  - 5) 111-3
  - 6) 111-4
- 111-2, 3, 4 - look like recombinants

4/30/97

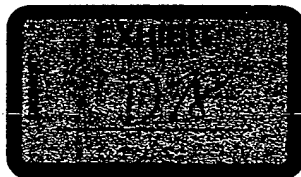
PCR analysis of 111 plagues

primers K91, K97



- 1) ladder
- 2) blank
- 3) AS4
- 4) pGEM4
- 5) p111
- 6) 111-1
- 7) 111-2
- 8) 111-3
- 9) 111-4

Conclusion is  $\Rightarrow$  all plagues are



4/30. Ligation:

cloning experiment 14. (14 ex).

- 1) Vector p223 / Bst 11071 + Xba I (PEG prep.)
- 2) Vector p223 / Bst 11071 + Xba I (Wikit prep.)
- 3) Insert 1101/1107 PCR ITR / Bst 11071 + Xba I  
(without gel purification).

S/S. Comparing growth properties of: (plaque efficiency)

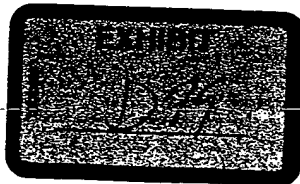
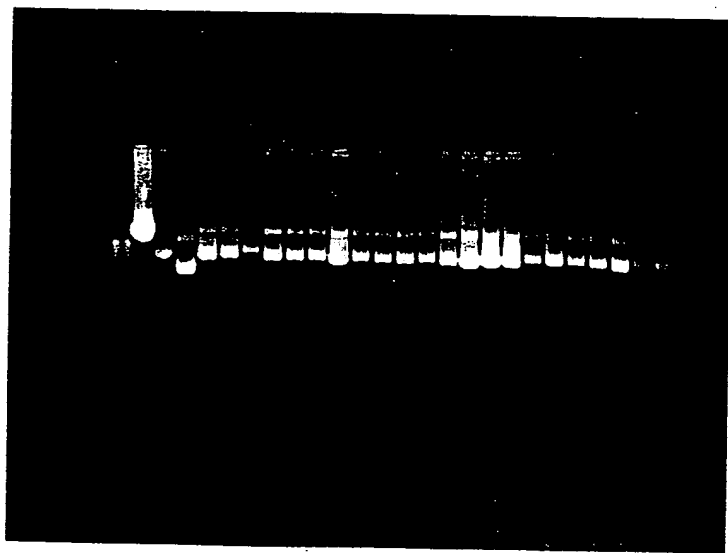
54 (4)	Controls	309
101 (1)		1101/1107
111 (1)		7001
111 (2)		m1 m41 (pm 734.1)

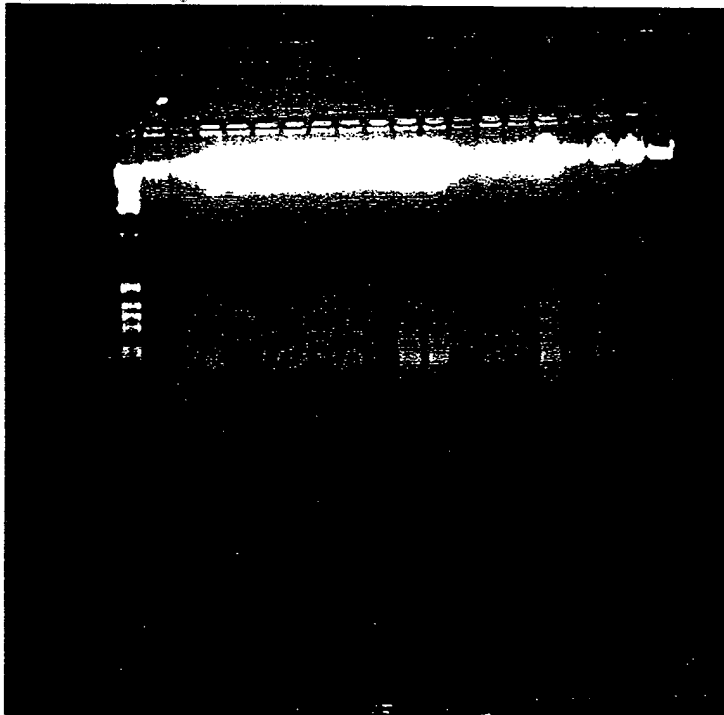
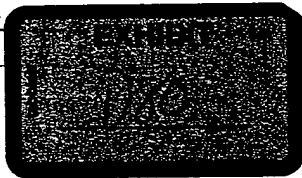
8/6/97

Manipreps of 14 ex.

- 1) ladder
- 2) p82
- 3) p223
- 4) 12ex-1
- 5)
- 6) 14ex1 (1-3)
- 7)
- 9) 14ex2 (1-20)
- 10)
- ↓
- 20)

⇒ 12ex-1 - junk.





4/6/97

1) ladder

Xba + Nde  
restriction of  
~~2~~ 14 ex clones

2) p223

141 (A3)

142 (1-20)

Xba +  
Nde

Clones:

141-3

142

1, 2, 3,

5, 6, 7, 8, 9, 10,

13,

15, 16, 17, 18, 19

on trunks

4/7/97

1) ladder

2) p223

3) 141 (3)

4) 142 (1)

5) 142 (2)

6) 142 (3)

7) 142 (5)

8) 142 (6)

9) 142 (7)

10) 142 (8)

11) 142 (9)

12) 142 (10)

13) 142 (13)

14) 142 (15)

15) 142 (16)

16) 142 (17)

17) 142 (18)

18) 142 (19)

19) 141 (11) (wt)

All rec  
clones  
from A  
are  
rec-ts.

bs 2171

(bs 1107)

+ Xba L

20/142/19  
wt)

4/8

# Sequencing

- u) 25 - p141(3) - primer u) 16
- u) 26 - p141(3) - ~~1~~ u) 17
- u) 27 - p142(1) - ~~1~~ u) 16
- u) 28 - p142(1) - ~~1~~ u) 17

sequencing  
Didn't work

sequence is OK.

4/14. properly vectors pBSSK(+)/Sma 1. ucl. 30°C  
p142(1) Bam + Nde. ucl

rec 700, pm 734.1 predicted  
fragments length for Srt1-Nde  
digestion:

19549  
7981  
11846  
3559

## Ligation:

Cloning exp 15 (p142(1) Bam + Nde + pG1 ucl  
Bam-Nde B fr.)

Cloning exp 16 (pBSSK Sma + rec 700 / Srt + Nde + T4 pol)

Cloning exp 17 (pBSSK Sma + pm 734.1 / Srt + Nde + T4 pol)

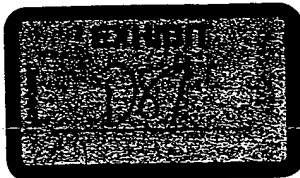
5/16. Results of transform. DMS α with 15, 16, 17 ex:

15 v - 1  
15 vL - 14  
15 ex - 25

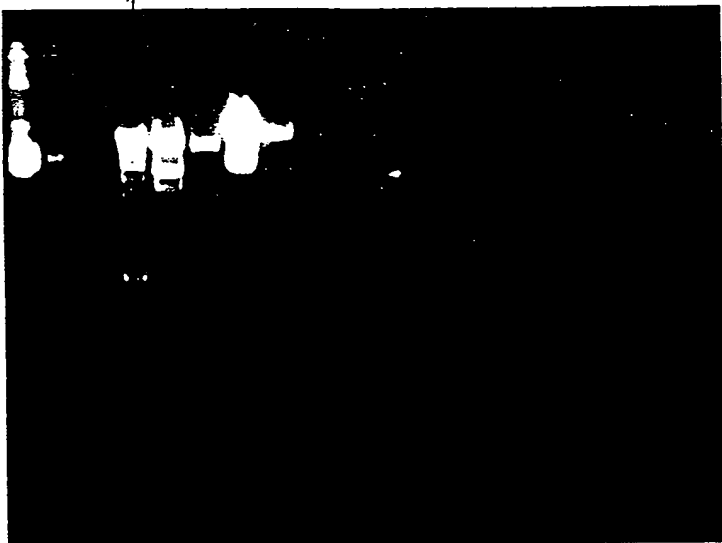
15-2 - MW as 82.  
others either wt 142-1 or small  
plasmids

16 v - 0  
16 vL - 2R + 1W  
16 ex - 5R + 19W  
17 ex - 7W

} all wt or same size



12 3 4



4/20

- 1) p82
- 2) p152

part 1

1 ladder

- 2) p82 } Bonnell
- 3) p152 } Nde1
- 4) p82 } Nde1+
- 5) p152 } X631

Conclusion: 152 is ok, making cell prep.

SIRB Uniprep of 17ex,  
17ex - 2 / 17ex  
- exercise fragment from gel

- 1) ladder
- 2) p82 (+)
- 3) 17ex

↓

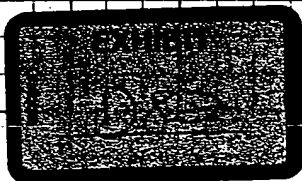
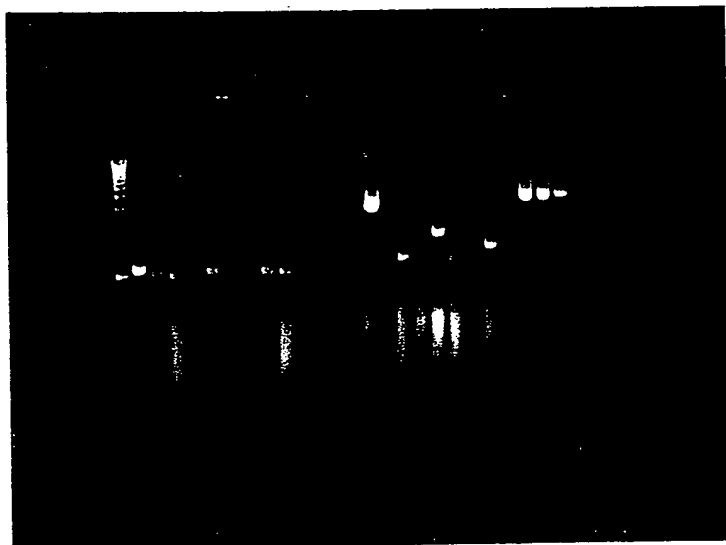
1-12

17ex2

1-12

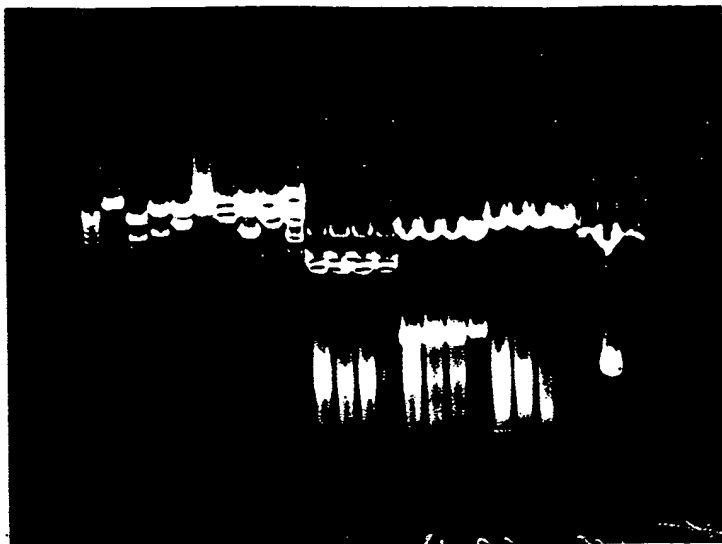
take 172-1, 10, 11, 12

172-5? } possibly  
172-8? } same junk.



5/29/97

22-141 50 SHEETS  
22-142 100 SHEETS  
22-144 200 SHEETS

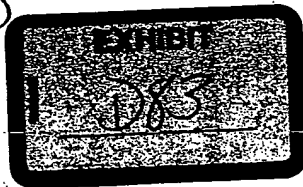


- 1) p82
- 2) p82
- 3) p82 / Bam + Nde
- 4) p82 / Nde + Xba
- 5) p82 / bst 1107 I
- 6) p152
- 7) p152 / Bam + Nde
- 8) p152 / Nde + Xba
- 9) p152 / bst 1107 I
- 10) 734.1 / Srf + Nde
- 11) 1721
- 12) 17210
- 13) 17211
- 14) 17212
- 15) 1721
- 16) 17210
- 17) 17211
- 18) 17212
- 19) 1721
- 20) 17210
- 21) 17211
- 22) 17212
- 23) pcigp191c / Xba + Xho
- 24) 1101/1107 / Spe + EcoRI

Conclusion: 152 is as expected.

17ex clones have correct insert in some (direct) orientation (EcoRI digestion) Xba doesn't cut insert due to methylation of Xba site.

The insert could be cut out with BamI-SalI to clone it into pCDNA3.1 BamI-XhoI sites.



5/28/97

Transformation 1101/1127 EcoRI + SpeI + p152.

6 dishes 293 / TTF  
8 dishes 293

293 TTF.

2 dishes - control. (1 ml)  
4 dishes - experiment. 2 - TTF (1 ml)  
2 - + Cuv/TTF (1 ml).

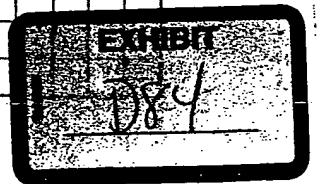
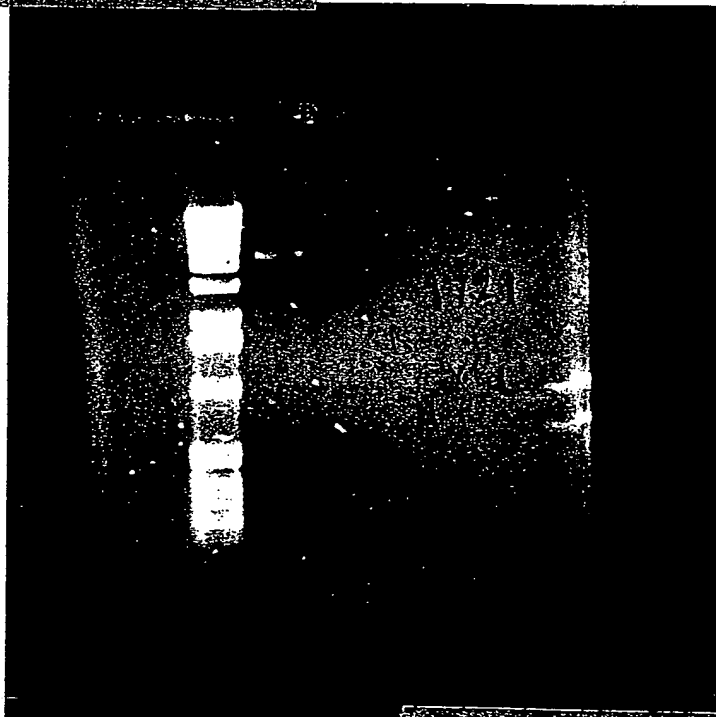
5/29/97

Cloning 18 ex:

172 BamI + SalI + XbaI (last)  $\Rightarrow$  3.5 kb (A)  
fragment (1:100) + CIP  $\Rightarrow$  (buffer)

pCDNA3.1 BamI + XbaI  $\Rightarrow$  vector  
7bp 5.0 kb  $\Rightarrow$  (buffer)

V(92) = 8, VL  $\approx$  30, ex  $\approx$  300, L(10 $\mu$ ) = 0



First cell culture experiment with KO1-2-3 5/15/97

5/15/97 Plaque assay of E3 viruses 293 cells

Day		Number of plaques		Plaque size (mm)		Plaque size (mm)		Plaque size (mm)		Plaque size (mm)		Plaque size (mm)		Plaque size (mm)		Plaque size (mm)		Plaque size (mm)	
Virus		Number of plaques		Plaque size (mm)		Plaque size (mm)		Plaque size (mm)		Plaque size (mm)		Plaque size (mm)		Plaque size (mm)		Plaque size (mm)		Plaque size (mm)	
309		3		4		5		6		7		8		9		10		11	
(2)		1/1		8/2		~100/1-5		~50/1-5		~500/1-5		Same		complete CPE		~100		complete CPE	
(1)		0/0		0/0		~20/1-2		~50/1-5		~100/1-5		Same		~100		~100		~100	
110/1107		(2)		0/0		0/0		~50/1-2		~50/1-5		Same		~100		~100		~100	
(1)		0/0		0/0		5/1		10/1-2		10/1-2		same		~30		~30		~30	
7001		(3)		0/0		0/0		0/0		0/0		0/0		0/0		0/0		0/0	
(2)		0/0		0/0		0/0		0/0		0/0		0/0		0/0		0/0		0/0	
pm T34.1		(4)		0/0		0/0		0/0		0/0		0/0		0/0		0/0		~30	
(3)		0/0		0/0		0/0		0/0		0/0		0/0		0/0		0/0		0/0	
(2)		0/0		0/0		0/0		0/0		0/0		0/0		0/0		0/0		0/0	
544		(4)		0/0		0/0		10/1		8/1-2		20/1-2		30/1-2		~100 (fine)		~100	
(5)		0/0		0/0		0/0		1/1		4/1-2		Same		8 (fine)		30		30	
101-1		(4)		6/1		10/1-2		>100/1-5		>300/1-5		>1000		Same		complete CPE		Complete CPE	
(3)		0/0		0/0		~50/1-5		~50/1-5		~50/1-5		~200		Same		>300		>300	
(2)		0/0		0/1		~15/1-5		~30/1-5		~30		Same		>20 large		100		100	
111-1		(4)		6/2		9/2-3		>100/1-10		>300/1-10		>1000		Same		complete CPE		complete CPE	
(3)		0/0		1/8		~50/1-10		~80/1-10		~80		Same		~300		~300		~300	
(2)		0/0		0/0		1/1		1/1		30/1-5		~50		same		~50 large		~50	
111-2		(4)		0/0		8/3-5		20/1-2		50/1-5		50		same		~100		>100	
(3)		0/0		1/1		10/1		20/1-5		30		same		~50		>50		>50	
(2)		0/0		0/0		0/0		7/1		10		same		~23		~23		28	
309		(2)		CCPE		CCPE		CCPE		CCPE		CCPE		CCPE		CCPE		CCPE	
110/1107		(2)		CCPE		CCPE		CCPE		CCPE		CCPE		CCPE		CCPE		CCPE	
7001		(2)		2		3		3		3		3		3		3		3	
pm T34.1		(2)		0		1		3		3		3		3		3		3	
(3)		0		0		0		0		0		0		0		0		0	
(2)		0		0		0		0		0		0		0		0		0	
544		(2)		~100		~100		~100		~100		~100		~100		~100		~100	
(3)		33		33		33		33		33		33		33		33		33	
101-1		(4)		CCPE		CCPE		CCPE		CCPE		CCPE		CCPE		CCPE		CCPE	
(3)		CCPE		CCPE		CCPE		CCPE		CCPE		CCPE		CCPE		CCPE		CCPE	
(2)		CCPE		CCPE		CCPE		CCPE		CCPE		CCPE		CCPE		CCPE		CCPE	
111-1		(4)		CCPE		CCPE		CCPE		CCPE		CCPE		CCPE		CCPE		CCPE	
(3)		CCPE		CCPE		CCPE		CCPE		CCPE		CCPE		CCPE		CCPE		CCPE	
(2)		~50		50		50		50		50		50		50		50		50	
111-2		(4)		>100		~100		~100		~100		~100		~100		~100		~100	
(3)		~3,750		~50		~50		~50		~50		~50		~50		~50		~50	





715 ICC RPT in ES program - development on 1/5/44.

deg = 5

6

7

8

9

12

(12+1)

(14)

(15)

(18)

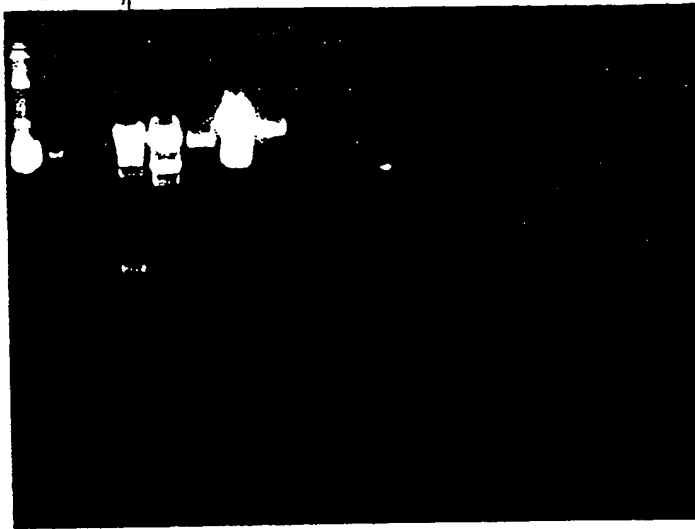
Friday Saturday

	12	52	~100	~100	~100	CCPE		
809 (~1)	1	5	14	19	20			
(~0.1+1)	3	7	19	26	27			
(~0.1-2)	0	0	3 <sub>small</sub>	8	15			
101/102 (~1)	0	0	1	3	3	5	6	
(~0.1+1)	0	0	0	0	1	2	2	
(~0.1-2)	0	0	0	0	0	0	0	
7001 (~3)	0	0	0	0	0	0	0	2
(~2)	0	0	0	0	0	0	0	2
734.1 (~3)	0	0	0	0	0	8	8	11
(~2)	0	0	0	0	0	4	5	6
								15
								9
								10
101-1 (~3)	1	14	48	60	~60			
(~2)	3?	7	20	30	34			
01-1 (~1)	0	2	3	4	7	9	11	
11-1 (~3)	0	6	35	50	~50			
(~2)	0	0	5	9	16			
(~1)	0	0	2	4	4		8	11
11-2 (~4)	3?	30	70	100	~100			
(~3)	2?	4	16	20	30			
(~2)	0	0	1	4	4	6		
(~1)	0	0	0	0	0	0		7



22-141 50 SHEETS  
22-142 100 SHEETS  
22-144 200 SHEETS

12 > 4



4/20

- 1) p82
- 2) p152

father 1000

3) ladder

4) p82 } Barnett

5) p152 } Nde1

6) p82 } Nde1

7) p152 } X63

Concluser 152 is ok,  
making cell prep.

5/25 Whirps of 17ex

7 ex - 2 (17ex)

- exercise fragment from gel

1) ladder

2) p82 (+)

3) 17ex

↓

1-12

17ex2

1-12

Take 172-1, 10, 11, 12

172-5?

172-8?

} possible  
source Jink.



EXHIBIT  
D87

8944, 5/5/97, 5/21/97

Ray (Plagues)

Units: 5 6 7 8 9 10 11 12 13 14 15 16 17 18

300

4 12 33 45 47  
8.5 25 10 15 100

#

1101/1107

18 14 18  
19 159 185

207 21  
95 100

7001

734.1

12 13 14 24  
50 154 170 100

544

14 25 91 42  
133 159 197 100

101-1

3 9 25 34 41 43  
17 20 53 193 195 100

111-1

2 1 16 20 30  
17 113 53 186 100

EXHIBIT

D88

22-141 50 SHEETS  
22-142 100 SHEETS  
22-144 200 SHEETS



5/15/97 Player development on 295. (i. players)

mins <sup>day</sup> 4 5 6 7 8 10 14 15 16 18 19 22 23 24  
305 10 25 50 100 100

110/1107 8.3 16 50 83 100

700/ ~~25 50 75 100~~ ?

734.1 (135 235 30 33 55 76 100) !

544. 3 12 27 90 100

101-1. (1) 15 30 70 100

111-1 20 60 100 ?

111-2 21 36 69 84 96 100

5/15/97 ↑ Same, AS49.

5 6 7 8 9 12 13 14  
309 11 25 70 96 100

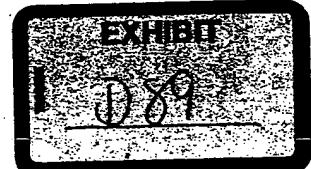
110/1107 16 50 83 100

~~734.1~~ 70 76 100 ?

101-1 18 27 36 63 82 100

111-1 25 50 100

111-2 16 66 100



5/15/97 Plaque assay of ES viruses 293 cells

Day	Number of plaques	plaque size (mm)										
Virus (name)	1	2	3	4	5	6	7	8	9	10	11	12
309	(~2) 1/1	8/12	~100/1-5	~300/1-5	~500/1-5	same	complete CPE	~1000	complete CPE			
	(~1) 0/0	0/0	~20/1-2	~50/1-3	~100/1-5	same	~100		~200			
110/1107	(~2) 0/0	0/0	~50/1-2	~30/1-5	~50/1-5	same	~100		~200			
	(~1) 0/0	0/0	5/1	10/1-2	10/1-2	same	~30		50			
7001	(~3) 0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	2			
	(~2) 0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0			
pm T34.1	(~4) 0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	~30			
	(~3) 0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0			
	(~2) 0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0			
544	(~4) 0/0	0/0	10/1	18/1-2	20/1-2	30/1-2	~60/1-2	~100	~100			
	(~3) 0/0	0/0	0/0	1/1	4/1-2	same	5 (-1-2)		30			
101-1	(~4) 6/1	15/1-2	>100/1-5	>300/1-5	>1000	same	complete CPE		Complete			
	(~3) 0/0	0/0	~50/1-5	~80/1-5	>100	same	>300		>300			
	(~2) 0/0	0/1	~15/1-5	~30/1-5	>30	same	>70 Range		100			
111-1	(~4) 6/2	9/2-8	>100/1-10	>300/1-10	>1000	same	complete CPE	~10 <sup>4</sup>	complete CPE			
	(~3) 0/0	1/8	~50/1-10	~80/1-10	~80	same	~300		>300			
	(~2) 0/0	0/0	10/1	30/1-3	~50	same	~50 Range		>50			
111-2	(~4) 0/0	8/8-5	20/1-2	50/1-5	50	same	~100		>100			
	(~3) 0/0	1/1	10/1	20/1-5	30	same	~50		>50			
	(~2) 0/0	0/0	0/0	7/1	12	same	23		28			
309	(~2) CCPE	CCPE	CCPE	CCPE	CCPE	CCPE	CCPE	CCPE	CCPE	CCPE	CCPE	CCPE
110/1107	(~2) CCPE	CCPE	CCPE	CCPE	CCPE	CCPE	CCPE	CCPE	CCPE	CCPE	CCPE	CCPE
7001	(~3) 2	3	3	3	3	3	3	3	3	3	3	3
	(~2) 0	1	3	3	3	3	3	3	3	3	3	3
pm T34.1	(~4) 50	60	60	70	70	70	70	70	70	70	70	70
	(~3) 1	7	9	10	16	16	16	16	16	16	16	16
	(~2) 0	0	1	1	2	2	2	2	2	2	2	2
544	(~4) ~100	~100	~100	~100	~100	~100	~100	~100	~100	~100	~100	~100
	(~3) 33	33	33	33	33	33	33	33	33	33	33	33
101-1	(~4) CCPE	CCPE	CCPE	CCPE	CCPE	CCPE	CCPE	CCPE	CCPE	CCPE	CCPE	CCPE
	(~3) CCPE	CCPE	CCPE	CCPE	CCPE	CCPE	CCPE	CCPE	CCPE	CCPE	CCPE	CCPE
	(~2) CCPE	CCPE	CCPE	CCPE	CCPE	CCPE	CCPE	CCPE	CCPE	CCPE	CCPE	CCPE
111-1	(~4) CCPE	CCPE	CCPE	CCPE	CCPE	CCPE	CCPE	CCPE	CCPE	CCPE	CCPE	CCPE
	(~3) CCPE	CCPE	CCPE	CCPE	CCPE	CCPE	CCPE	CCPE	CCPE	CCPE	CCPE	CCPE
	(~2) 50	50	50	50	50	50	50	50	50	50	50	50
111-2	(~4) 500	~100	~100	~100	~100	~100	~100	~100	~100	~100	~100	~100
	(~3) 750	~50	~50	~50	~50	~50	~50	~50	~50	~50	~50	~50
	(~2) 32	33	33	33	33	33	33	33	33	33	33	33

EXHIBIT  
D90

First cell culture experiment with  
KO1, 2, 3  
5/15/97

5/15 Fee ADP a. E3 plaque development on ASW

deg = 5

6

7

8

Friday Saturday

12

(12+1)

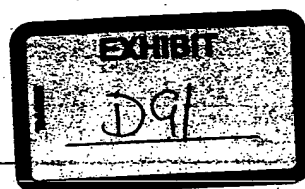
(14)

(15)

(16)

CCPE

309 (~1)	12	52	~100	~100	~100	CCPE			
(~0.1+1)	1	5	14	19	20				
(~0.1-2)	3	7	19	26	27				
(~1)	0	0	3 smth	8	15				
101/107 (~0.1+1)	0	0	1	3	3	5	6		
(~0.1-2)	0	0	0	0	1	2	2		
7001 (~3)	0	0	0	0	0	0	0	2	2
(~2)	0	0	0	0	0	0	0		
734.1 (~3)	0	0	0	0	0	8	8	11	15
(~2)	0	0	0	0	0	4	5	6	9
101-1 (~3)	1	11	48	60	~60				
(~2)	3?	7	20	30	34				
01-1 (~1)	0	2	3	4	7	9			
11-1 (~3)	0	6	35	50	~50				
(~2)	0	0	5	9	16				
(~1)	0	0	2	4	4			8	11
11-2 (~4)	3?	30	70	100	~100				
(~3)	2?	4	16	20	30				
(~2)	0	0	1	4	4	6			7
(~1)	0	0	0	0	0	0			



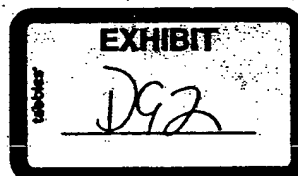
22-141 50 SHEETS  
22-142 100 SHEETS  
22-146 200 SHEETS

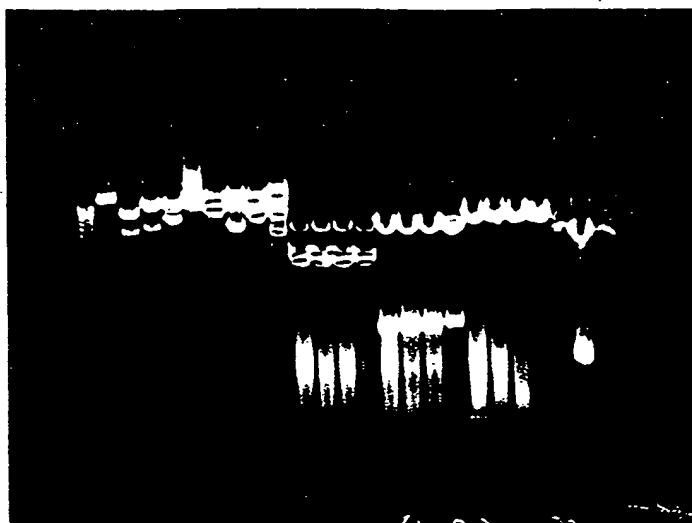
5/21/97 Plaque assay of E3 viruses on ASU9,  
(analogue) is dying, data are not quantitative.

22-141 50 SHEETS  
22-142 100 SHEETS  
22-143 200 SHEETS



viral plaques		6	7	8	12	14
309	(~2) ~30					
	(~1) 3	12	33			
01	(~3) 0	3	17	2.7		
1107	(~2) 0	3	17	3.0		
	(~1) 0	0	6	7		
00	(~4) 0	0	1	1	6	
	(~3) 0	0	0	0		
734	(~4) 0	0	0			
	(~3) 0	6	0	2	3	
544	(~4) 14	24	239			
	(~3) 0	1	2	3	3	
	(~2) 0	0	0	0	0	
1011	(~3) 0	11	28			
	(~2) 0	3	11	12		
11-1	(~3) 0	0	3	5		
	(~2) 0	0	7	14		
11-2	(~3) 0	7	27			
	(~2) 0	0	1	2		
	(~1) 0	0		0		





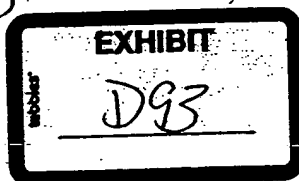
5/29/97

- 1) p82
- 2) p82
- 3) p82 / Bam + Nde
- 4) p82 / Nde + Xba
- 5) p82 / Not 1107 I
- 6) p152
- 7) p152 / Bam + Nde
- 8) p152 / Nde + Xba
- 9) p152 / Not 1107 I
- 10) 7341 / Srf + Nde
- 11) 1721
- 12) 17210
- 13) 17211
- 14) 17212
- 15) 1721
- 16) 17210
- 17) 17211
- 18) 17212
- 19) 1721
- 20) 17210
- 21) 17211
- 22) 17212
- 23) pCigp121C / Xba + Xho
- 24) 1101/1107 / Spe + EcoRI

Conclusion: 152 is as expected.

17ex clones have correct insert in some (direct) orientation (EcoRI digestion) Xba doesn't cut insert due to methylation of Xba site.

The insert could be cut out with BamI-SbfI to clone it into pCDNA3.1 BamI-XhoI sites.





5/28/97

Transfection 1101/1107 EcoRI + SpeI + p152.

6 dishes 293/TTF  
8 dishes 293

293 TTF

2 dishes - control (1 ml)  
4 dishes - experiment 2 - TTF (1 ml)  
2 - + env/TTF (1 ml)

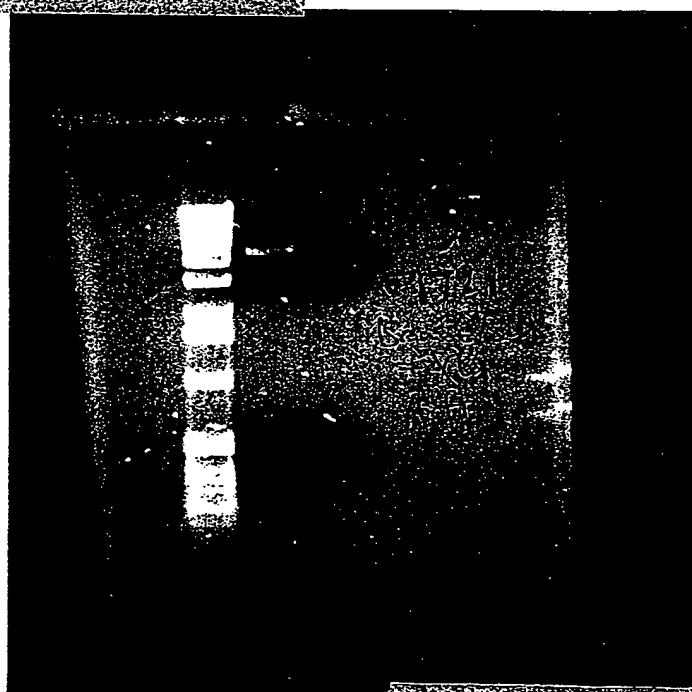
5/29/97

Cloning 18 ex:

172 BamI + SalI + XbaI (last)  $\Rightarrow$  2.5 kb (8)  
(fragment (1 cat) + CTP  $\Rightarrow$  (buffer))

pCDNA3 BamI + XhoI  $\Rightarrow$  vector  
700 5.0 kb  $\Rightarrow$  (buffer))

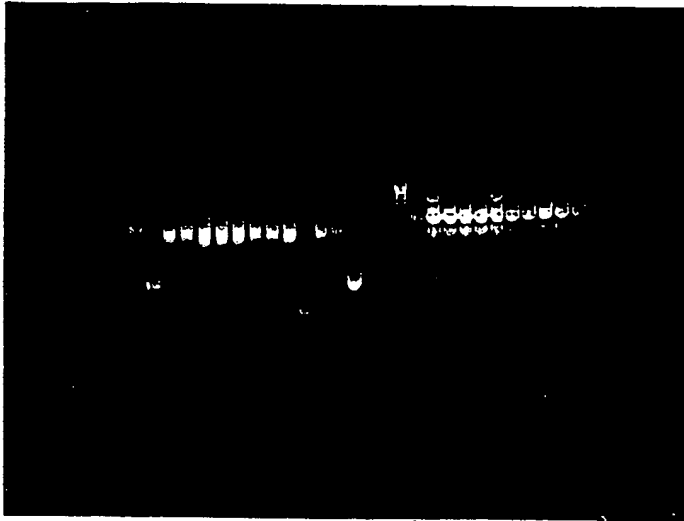
V(9N) - 8, VL ~ 30, ex ~ 300, LC (10 $\mu$ l) -



6/5/97

18 ex miniprep  $\Rightarrow$  1-8, 10, 11 - look like rect's  
(~~growth~~ <sup>growth</sup> MW)

22-141 50 SHEETS  
22-142 100 SHEETS  
22-144 200 SHEETS



1) Ladder

2)  $\downarrow$  18 ex (1-12)

Take 1-8, 10, 11.

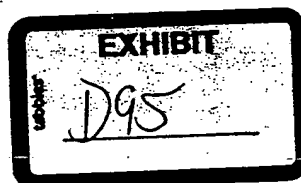
1) Ladder

2) pCDNA3.1Zeo(+)

3)  $\downarrow$  18 ex  
1-8, 10, 11

Look like rect's.

Grow 18(1).



6/5/97

VIPA - infections:

1101/1107; 544; 101-1; 111-1; 734.1

E - early (9-15)  
L - late (24-28)

(295)E

(293-7)E

(2549)E

(295)E

(29)E

(2549)E

1101/1107 - 2  
544 - 3  
101-1 - 4  
111-1 - 5  
734.1 - 6

7  
8  
9  
10  
11  
12

13  
14  
15  
16  
17  
18

19  
20  
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24

25  
26  
27  
28  
29  
30

31  
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34  
35  
36

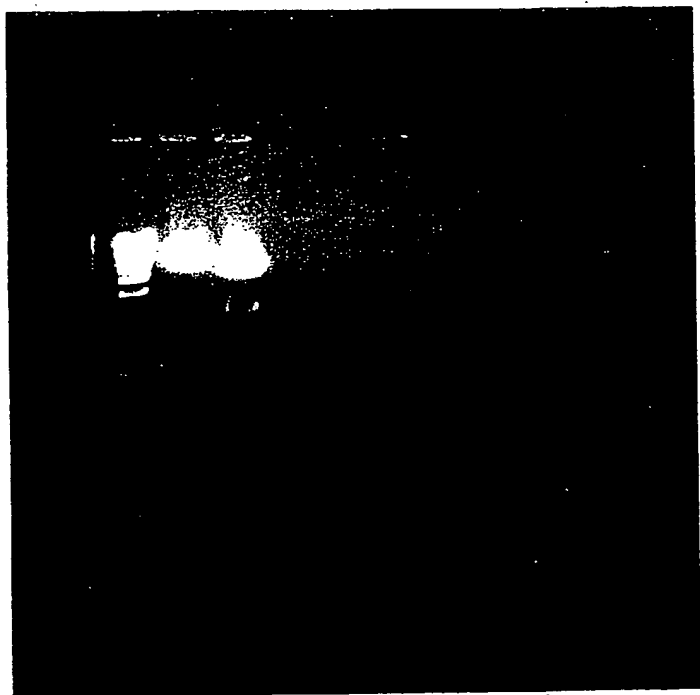
2549

295

- Vinses dosage.  
(and stocks  
of vinses)

1101/1107 - 100µl  
544 - 100µl  
101-1 - 100µl  
111-2 - 150µl  
734.1 - 100µl

1101/1107 - 100µl  
544 - 100µl  
101-1 - 100µl  
111-2 - 150µl  
734.1 - 100µl



6/10/97  
Restriction pattern  
for 181 max prep.

1) ladder

2) 181/Spel + PseI

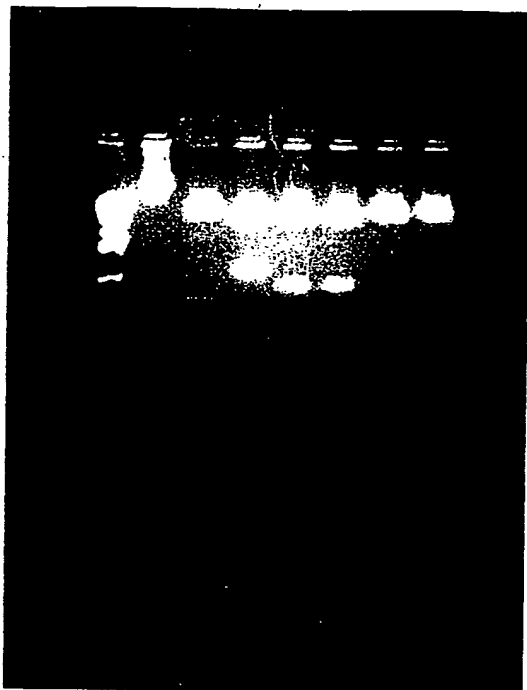
3) 181/Spel + XhoI

Pattern is as  
expected.

EXHIBIT  
D98

6/25/97

Restriction digestion of pCI-14.7 (Terry).



1) ladder

2) pCI-14.7

3) — EcoRI

4) — BglII

5) — SpeI + XhoI

6) — SpeI + SalI

7) — BamHI + XhoI

8) — BamHI + SalI

7/1/97 Clonings 19 ex; 20 ex.

19 ex — vector p#30 (SmaBI); insert 19 ex 1 { p181  
Mfe  
Xba  
Klenow

19 ex 2 { p181  
Mfe  
RV  
Klenow

20 ex — vector pL2/BacI + T4; insert 20 ex 1 p181  
MX KL

7/3 transformation Msd.

20 V ~ 10  
20 VL ~ 50  
20 ex 1 ~ 100  
20 ex 11 ~ 30

19 V ~ 20  
19 VL ~ 100  
19 ex 1 ~ 100  
19 ex 11 ~ 100.

20 ex 2 p181  
M R V KL

EXHIBIT

D97



Dear Dan:

Attached is a list of primers that were ordered by Konstantin Doronin. The primers were named KD1, KD2, KD3, KD4, KD5, etc. (see Description/Sequences). These primers were used in studies on the ADP-overexpressing vectors, either for DNA sequencing or for amplification of certain sequences by the polymerase chain reaction (PCR). Also attached are Dr. Doronin's handwritten notes indicating the use of the primers. (These notes are not dated, but this list was begun when the primers were ordered). Please note that the primers were ordered on 9/26/96, 11/04/96, and 03/24/97.

Also included are some actual DNA sequence data using some of these primers to sequence some of the plasmids that were used to construct the ADP-overexpressing vectors. The dates of the sequencing runs are on the datasheets. Note that the first sequencing run was on November 19, 1996. Other runs were on November 25/26, 1996, March 20/21, 1997, April 21, 1997, May 12, 1997, and March 23/24, 1999.

Thanks,

Bill

Order Number		
Please refer to this No. on all Inquires	Order Date	Page No.
473935 A	09/26/98	1 of 1

**SOLD TO**

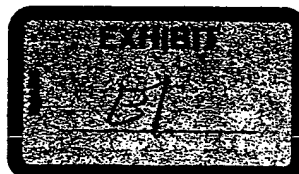
ST LOUIS UNIV  
ACCOUNTS PAYABLE  
3500 LINDELL BLVD  
ST LOUIS, MO 63103

**SHIP TO**

ST LOUIS UNIV SCHOOL OF MED  
DEPT OF MICROBIOLOGY  
1402 S GRAND BLVD  
ST LOUIS, MO 63104  
DORONIN  
000127752

MLR	5903851	FAX/DEBBIE HUMISTON
-----	---------	---------------------

1.0	10336-022	KD1 \ DORONIN	1 Each	( G07 )	19.3
	A3884G07	CTACGAGAGAACCTCTCCGAG			
2.0	10336-022	KD2 \ DORONIN	1 Each	( G08 )	15.5
	A3884G08	GCCACAACCTTATACTGTTTGC			
3.0	10336-022	KD3 \ DORONIN	1 Each	( G09 )	28.6
	A3884G09	TCAGCCCACGGTACTTAATTAACCCAAAAGGTGGAT			
4.0	10336-022	KD4 \ DORONIN	1 Each	( G10 )	18.8
	A3884G10	GCTCTAGAAGTCAGGCTTCCTGG			
5.0	10336-022	KD5 \ DORONIN	1 Each	( G11 )	17.8
	A3884G11	GCTCTAGATCTCATTTAATCATA			
6.0	10336-022	KD6 \ DORONIN	1 Each	( G12 )	21.5
	A3884G12	CCTTAATTAAGTCAGGCTTCCTGG			
7.0	10336-022	KD7 \ DORONIN	1 Each	( H01 )	20.3
	A3884H01	CCTTAATTAATCTCATTTAATCATA			
8.0	10336-022	KD8 \ DORONIN	1 Each	( H02 )	21.7
	A3884H02	CGCCTATACAGAAGATTTTCCAG			
9.0	10336-022	KD9 \ DORONIN	1 Each	( H03 )	20.5
	A3884H03	CGCCTATACACTGCAGCAGGTGTG			



**GIBCO BRL Custom Primers**  
*Certificate of Analysis*

ST LOUIS UNIV SCHOOL OF
Order Number: 473935A
Order Date: 09/26/96

**Primer 1:**

Primer Name: KD1  
Researcher: DORONIN  
Sequence (5' to 3'): CTA CGA GAG AAC CTC TCC GAG  
Molecular Weight  $\mu\text{g}/\mu\text{mole}$ : 6740.2  
Millimolar Extinction Coefficient: 230.5  
  
Purity Deprotected  
Tm (1 M Na+) 73  
Tm (50 mM Na+) 51  
% GC 57

Primer Number: A3884G07 (G07)  
Primer Length: 21  
  
 $\mu\text{g}$  per OD: 29.2  
nmoles per OD: 4.3  
OD's 19.3  
 $\mu\text{g's}^*$  566  
nmoles 84  
Coupling Eff. 99%



Notes:

**Primer 2:**

Primer Name: KD2  
Researcher: DORONIN  
Sequence (5' to 3'): GCC ACA ACT TAT ACT GTT TGC  
Molecular Weight  $\mu\text{g}/\mu\text{mole}$ : 6696.2  
Millimolar Extinction Coefficient: 221.4  
  
Purity Deprotected  
Tm (1 M Na+) 67  
Tm (50 mM Na+) 45  
% GC 42

Primer Number: A3884G08 (G08)  
Primer Length: 21  
  
 $\mu\text{g}$  per OD: 30.2  
nmoles per OD: 4.5  
OD's 15.5  
 $\mu\text{g's}^*$  471  
nmoles 70  
Coupling Eff. 99%

Notes:

**Primer 3:**

Primer Name: KD3  
Researcher: DORONIN  
Sequence (5' to 3'): TCA GCC CAC GGT ACT TAA TTA ACC CAA AAG GTG  
GAT  
Molecular Weight  $\mu\text{g}/\mu\text{mole}$ : 11632.2  
Millimolar Extinction Coefficient: 407.2  
  
Purity Deprotected  
Tm (1 M Na+) 81  
Tm (50 mM Na+) 59  
% GC 44

Primer Number: A3884G09 (G09)  
Primer Length: 36  
  
 $\mu\text{g}$  per OD: 28.5  
nmoles per OD: 2.4  
OD's 28.6  
 $\mu\text{g's}^*$  817  
nmoles 70  
Coupling Eff. 99%

Notes:

\* -See Note about Quantities in  
Supporting Information.

ST LOUIS UNIV SCHOOL OF

Order Number: 473935A

Order Date: 09/26/96

# GIBCO BRL Custom Primers

## Certificate of Analysis

**Primer 4:**

Primer Name: KD4  
 Researcher: DORONIN  
 Sequence (5' to 3'): GCT CTA GAA GTC AGG CTT CCT GG  
 Molecular Weight  $\mu\text{g}/\mu\text{mole}$ : 7429.6  
 Millimolar Extinction Coefficient: 244.0  
 Purity Deprotected  
 Tm (1 M Na<sup>+</sup>) 75  
 Tm (50 mM Na<sup>+</sup>) 54  
 % GC 56

Primer Number: A3884G10 (G10)  
 Primer Length: 23  
 $\mu\text{g}$  per OD: 30.4  
 nmoles per OD: 4.1  
 OD's 18.6  
 $\mu\text{g's}^*$  568  
 nmoles 76  
 Coupling Eff. 99%

Notes:

**Primer 5:**

Primer Name: KD5  
 Researcher: DORONIN  
 Sequence (5' to 3'): GCT CTA GAT CTC ATT TAA TCA TA  
 Molecular Weight  $\mu\text{g}/\mu\text{mole}$ : 7348.6  
 Millimolar Extinction Coefficient: 251.4  
 Purity Deprotected  
 Tm (1 M Na<sup>+</sup>) 65  
 Tm (50 mM Na<sup>+</sup>) 43  
 % GC 30

Primer Number: A3884G11 (G11)  
 Primer Length: 23  
 $\mu\text{g}$  per OD: 29.2  
 nmoles per OD: 3.9  
 OD's 17.9  
 $\mu\text{g's}^*$  523  
 nmoles 71  
 Coupling Eff. 99%

Notes:

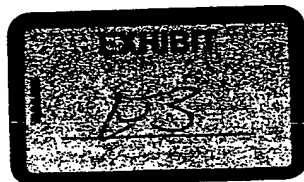
**Primer 6:**

Primer Name: KD6  
 Researcher: DORONIN  
 Sequence (5' to 3'): CCT TAA TTA AAA GTC AGG CTT CCT GG  
 Molecular Weight  $\mu\text{g}/\mu\text{mole}$ : 8370.2  
 Millimolar Extinction Coefficient: 284.9  
 Purity Deprotected  
 Tm (1 M Na<sup>+</sup>) 73  
 Tm (50 mM Na<sup>+</sup>) 51  
 % GC 42

Primer Number: A3884G12 (G12)  
 Primer Length: 26  
 $\mu\text{g}$  per OD: 29.3  
 nmoles per OD: 3.5  
 OD's 21.5  
 $\mu\text{g's}^*$  634  
 nmoles 76  
 Coupling Eff. 99%

Notes:

\* - See Note about Quantities in  
 Supporting Information.



LIFE  TECHNOLOGIES.



ST LOUIS UNIV SCHOOL OF

Order Number: 473935A

Order Date: 09/26/96

## GIBCO BRL Custom Primers Certificate of Analysis

**Primer 7:**

Primer Name: KD7  
Researcher: DORONIN  
Sequence (5' to 3'): CCT TAA TTA ATC TCA TTT AAT CAT A  
Molecular Weight  $\mu\text{g}/\mu\text{mole}$ : 7957.0  
Millimolar Extinction Coefficient: 277.0  
Purity Deprotected  
Tm (1 M Na<sup>+</sup>) 63  
Tm (50 mM Na<sup>+</sup>) 41  
% GC 20  
Notes:

Primer Number: A3884H01 (H01)  
Primer Length: 25  
 $\mu\text{g}$  per OD: 28.7  
nmoles per OD: 3.6  
OD's 20.3  
 $\mu\text{g's}^*$  585  
nmoles 73  
Coupling Eff. 99%

**Primer 8:**

Primer Name: KD8  
Researcher: DORONIN  
Sequence (5' to 3'): CGC GTA TAC AGA AGA TTT TTC CAG  
Molecular Weight  $\mu\text{g}/\mu\text{mole}$ : 7742.8  
Millimolar Extinction Coefficient: 268.2  
Purity Deprotected  
Tm (1 M Na<sup>+</sup>) 70  
Tm (50 mM Na<sup>+</sup>) 49  
% GC 41  
Notes:

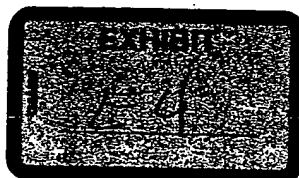
Primer Number: A3884H02 (H02)  
Primer Length: 24  
 $\mu\text{g}$  per OD: 28.8  
nmoles per OD: 3.7  
OD's 21.7  
 $\mu\text{g's}^*$  628  
nmoles 81  
Coupling Eff. 99%

**Primer 9:**

Primer Name: KD9  
Researcher: DORONIN  
Sequence (5' to 3'): CGC GTA TAC ACT GCA GCA GGT GTG  
Molecular Weight  $\mu\text{g}/\mu\text{mole}$ : 7784.8  
Millimolar Extinction Coefficient: 281.8  
Purity Deprotected  
Tm (1 M Na<sup>+</sup>) 77  
Tm (50 mM Na<sup>+</sup>) 56  
% GC 58  
Notes:

Primer Number: A3884H03 (H03)  
Primer Length: 24  
 $\mu\text{g}$  per OD: 29.7  
nmoles per OD: 3.8  
OD's 20.5  
 $\mu\text{g's}^*$  609  
nmoles 78  
Coupling Eff. 99%

\* See Note about Quantities in  
Supporting Information.

**LIFE TECHNOLOGIES**

Order Number		
Please refer to this No. on all Inquires	Order Date	Page No.
522393 A	11/04/98	1 of 1

**SOLD TO**

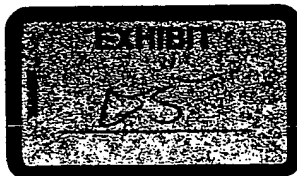
ST LOUIS UNIV  
ACCOUNTS PAYABLE  
3500 LINDELL BLVD  
ST LOUIS, MO 63103

**SHIP TO**

ST LOUIS UNIV SCHOOL OF MED  
1402 S GRAND BLVD  
MICROBIOLOGY  
ST LOUIS, MO 63104  
000127752

CEH	S903851	FAX/DEBBIE HUMISTON
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1.0	10336-022	KD 10 \ DORANIN	1 Each	( B02 )	12.6
	A4379B02	ACACGGCACCAGCTCAATCAG			
2.0	10336-022	KD 11 \ DORANIN	1 Each	( B03 )	12.5
	A4379B03	CGGAGTAACTTGATGTGTTG			



**GIBCO BRL Custom Primers**  
**Certificate of Analysis****ST LOUIS UNIV SCHOOL OF****Order Number: 522393A****Order Date: 11/04/96****Primer 1:**

Primer Name: KD 10

Researcher: DORANIN

Sequence (5' to 3'): ACA CGG CAC CAG CTC AAT CAG

Molecular Weight  $\mu\text{g}/\mu\text{mole}$ : 6709.2

Millimolar Extinction Coefficient: 232.1

Purity Deprotected

Tm (1 M Na+) 73

Tm (50 mM Na+) 51

% GC 57

Notes:

Primer Number: A4379B02 (B02)

Primer Length: 21

 $\mu\text{g}$  per OD: 28.9

nmoles per OD: 4.3

OD's 12.6

 $\mu\text{g's}^*$  366

nmoles 54

Coupling Eff. 98%

**Primer 2:**

Primer Name: KD 11

Researcher: DORANIN

Sequence (5' to 3'): CGG AGT AAC TTG TAT GTG TTG

Molecular Weight  $\mu\text{g}/\mu\text{mole}$ : 6847.2

Millimolar Extinction Coefficient: 233.0

Purity Deprotected

Tm (1 M Na+) 67

Tm (50 mM Na+) 45

% GC 42

Notes:

Primer Number: A4379B03 (B03)

Primer Length: 21

 $\mu\text{g}$  per OD: 29.3

nmoles per OD: 4.2

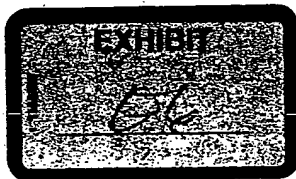
OD's 12.6

 $\mu\text{g's}^*$  369

nmoles 53

Coupling Eff. 98%

\* -See Note about Quantities in  
Supporting Information.

**LIFE TECHNOLOGIES**

Order Number		
Please refer to this No. on all Inquires	Order Date	Page No.
409867 A	03/24/97	1 of 1

**SOLD TO**

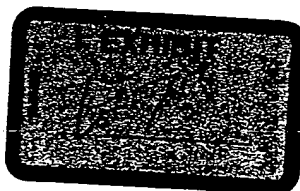
ST LOUIS UNIV  
ACCOUNTS PAYABLE  
3500 LINDELL BLVD  
ST LOUIS, MO 63103

**SHIP TO**

ST LOUIS UNIV SCHOOL OF MED  
1402 S GRAND BLVD  
MOLEC MICRO/RM M410  
ST LOUIS, MO 63104  
DEBBIE HUMISTON  
000127752

CD	S903850	DEBBIE HUMISTON
----	---------	-----------------

1.0	10336-022	KD12 \ DORONIN	1 Each	( D10 )	16.4
	A6280D10	CCTTAATTAATCTAGAGATCTTATTCCTTT			
2.0	10336-022	KD14 \ DORONIN	1 Each	( D11 )	14.7
	A6280D11	GGGGTACGAAGCCATCTGCAACAACAT			
3.0	10336-022	DK15 \ DORONIN	1 Each	( D12 )	13.7
	A6280D12	CCTTAATTAATCTAGAGTCAGTTAGCCTCCCC			
4.0	10336-022	KD16 \ DORONIN	1 Each	( E01 )	14.6
	A6280E01	CGCGCGTATACACTTCCCATTTTAAG			
5.0	10336-022	KD17 \ DORONIN	1 Each	( E02 )	12.8
	A6280E02	GCTCTAGACATCATCAATAATAT			



ST LOUIS UNIV SCHOOL OF

Order Number: 409867A

Order Date: 03/24/97

**GIBCO BRL Custom Primers**  
**Certificate of Analysis****Primer 4:**

Primer Name: KD16

Researcher: DORONIN

Sequence (5' to 3'): CGC GCG TAT ACA CTT CCC ATT TTA AG

Molecular Weight  $\mu\text{g}/\mu\text{mole}$ : 8306.2

Millimolar Extinction Coefficient: 272.6

Purity Deprotected

Tm (1 M Na+) 74

Tm (50 mM Na+) 63

% GC 46

Notes:

Primer Number: A6280E01 (E01)

Primer Length: 26

 $\mu\text{g}$  per OD: 30.4

nmoles per OD: 3.6

OD's 14.5

 $\mu\text{g's}^*$  444

nmoles 63

Coupling Eff. 99%

**Primer 5:**

Primer Name: KD17

Researcher: DORONIN

Sequence (5' to 3'): GCT CTA GAC ATC ATC AAT AAT AT

Molecular Weight  $\mu\text{g}/\mu\text{mole}$ : 7364.6

Millimolar Extinction Coefficient: 263.4

Purity Deprotected

Tm (1 M Na+) 66

Tm (50 mM Na+) 43

% GC 30

Notes:

Primer Number: A6280E02 (E02)

Primer Length: 23

 $\mu\text{g}$  per OD: 27.9

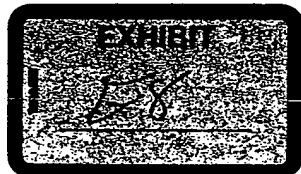
nmoles per OD: 3.8

OD's 12.9

 $\mu\text{g's}^*$  361

nmoles 49

Coupling Eff. 99%

\* -See Note about Quantities in  
Supporting Information.LIFE  TECHNOLOGIES.

## Primers:

1) KD1 - CTA'CGA'GAG'AAC'CTC'TCC'GAG'

Comment - primer from A15 sequence, 50 nt left from SmaI site - for PCR mutation of gp13K (E3) - Left primer.

2) KD2 - GCC'ACA'ACT'TAT'ACT'GTT'TCC

Comment - primer from A15 sequence ~ 50 nt right from Bst1107I site - for PCR mutation of gp13K (E3) - right primer.

3) KD3 - TCA'GCC'CAC'GGT'ACT'(TAA'TTAA)CC'CAA'AAG'GTG'GA

Comment - middle primer for mutation of gp13K E3 protein gene. inserting PacI site with TAA stop codon to the ORF destroying KpnI site simultaneously, to be used 1 with 'KD2, then product used as primer with 'KD1.

4) KD4 - GC'(TCT'AGA)'AGT'CAG'GCT'TCC'TGG

Comment - left primer for PCR of 11.6K E3 with XbaI site.

5) KD5 - GC'(TCT'AGA)'TCT'CAT'TTA'ATC'ATA

Comment - right primer for PCR of 11.6K E3 with XbaI site.

6) KD6 - CC'(TTAATTAA)'GT'CAG'GCT'TCC'TGG

Comment - left primer for PCR of 11.6K E2 with PacI site

7) KD7 - CC'(TTAATTAA)'TCT'CAT'TTA'ATC'ATA

Comment - right primer for PCR of 11.6K E3 with PacI site.

8) KD8) CGC'GTATAC'AGA'AGA'TTT'TTC'CAG'

upstream primer with Bst1107I site for PCR of SP-B 500 promoter.

9) KD9) CGC'GTATAC'ACT'GCA'GCA'GGT'GTC

downstream primer with Bst1107I site for PCR of SP-B 500 promoter.22-142 50 SHEETS  
22-142 100 SHEETS  
22-144 200 SHEETS

Primers for sequencing sEH substitutions ;  
primer.

- 10) (10): ACA'CGG'CAC'GAG'CTC'AAT'GAG' (left)  
11) KD(11): CCG'AGT'AAC'TTG'TAT'GTG'TTG (right)

Primers for TK insert into Pac and Xba sites. (double PCR,  
12+14, then product with 15  
on Ad template).

CC  
~~CC~~ TTAATTAA TCTAGA GAT'CTT'ATT'CCC'TTT

Primer with PacI and XbaI sites + Ad seq 30818 →  
upstream primer.

14) KD(14) ← left  
GGG'GTA'CGA'AGC'CAT'CTG'CAA'CAA'CAT

Primer left half from 5' the end, right half - from Ad ~ 31000  
→ beginning of fiber gene. to prevent methylation.

15) (15) CC TTAATTAA TCTAGA G TCA'GTT'AGC'CTC'CCC  
at the end. (3)

Primers to PCR Ad's right ITR (Ad. 35773-35935) with  
flanking bst1107I and XbaI sites. respectively.

(16) CCGCCGTATAC ACTITCC'CAT'TTT'AAG

(17) GC TCTAGA CAT'CAT'CAA'TAA'TAT

18) (18) - Direct - GTA-GAG-TTT-TCT-CCT-CCG  
for PCR and sequence of 1101/1107 dl.

19) (19) - Reverse - CCC-TCT-TCA-TCC-TCC-TCC

20 - TCT, ACT, TTA, ACC, CCA, TCT, CCG (E3 direct to C4 dl)

21 - CCG, AGG, TGT, TAT, TAC, CGA, AGA (E1A, 1101 dl)

22 - TGA, CGT, AAC, CCA, TAA, AGT, CCA (from E4 prom dl)  
direct

## **EXHIBIT F**





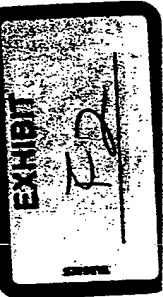
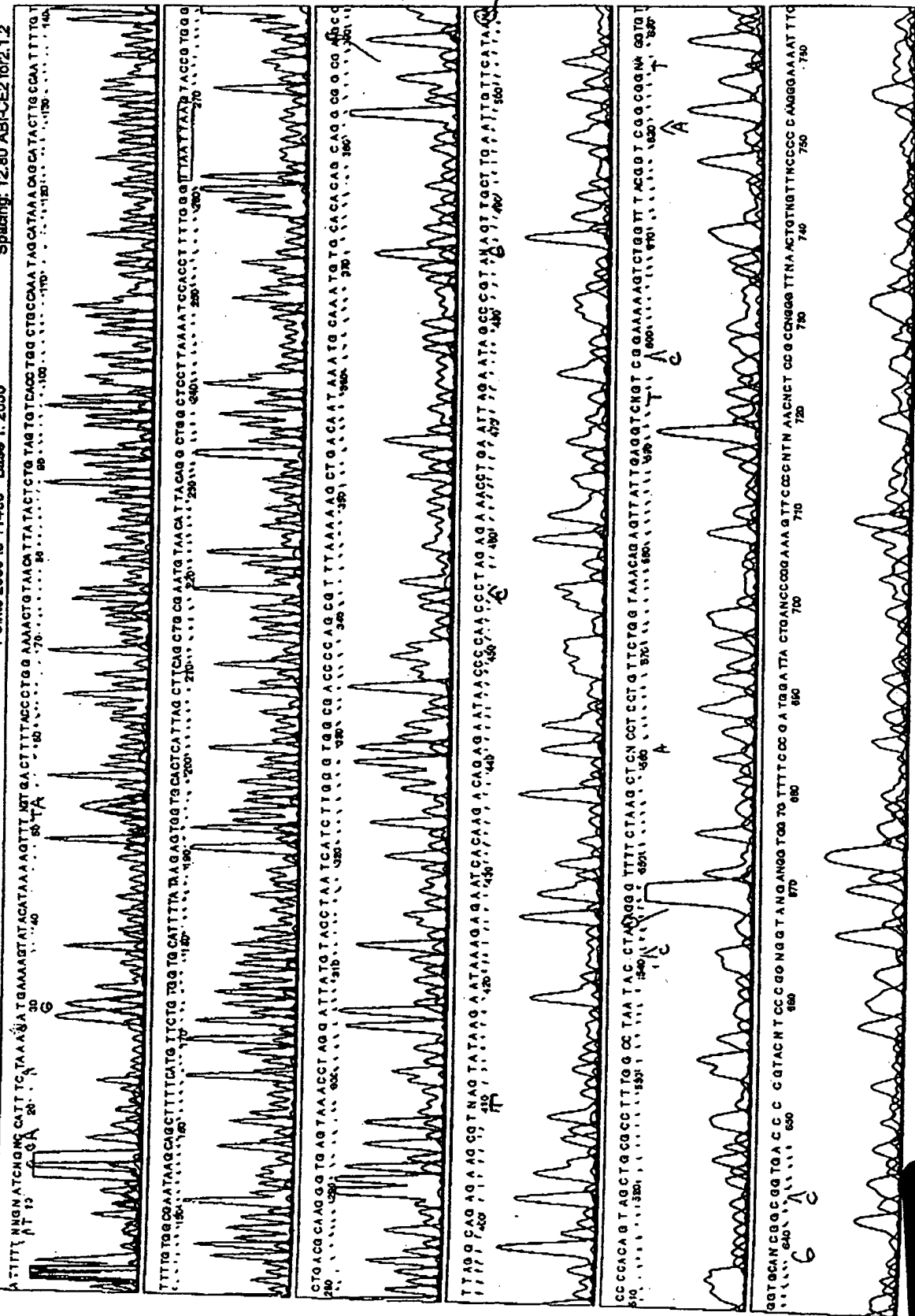
Model 910  
Version 2.1.2



A5-KD-#2  
KD-#2  
Lane 3

Signal G:182 A:289 T:155 C:92  
DT POP6 10-10-96  
POP6DT:Matrix  
Points 2050 to 11480 Base 1: 2050

Page 1 of 2  
Nov 26, 1996 9:53 AM  
Nov 25, 1996 7:38 PM  
Spacing: 12.80 ABI-CE2 for 2.1.2







Nov 26, 1996 9:53 AM  
Nov 26, 1996 4:08 AM  
Spacing: 12.80 ABI-CE2

Signal G:339 A:578 T:329 C:216  
DT POP6 10-10-96  
POP6DT.Matrx  
Points 2030 to 11480 Base 1: 2030

**A11-KD-#5**  
**KD-#5**  
**Lane 8**

**Model 310**  
**Version 2.1.2**



1 ex, clone 23, primer 10310.

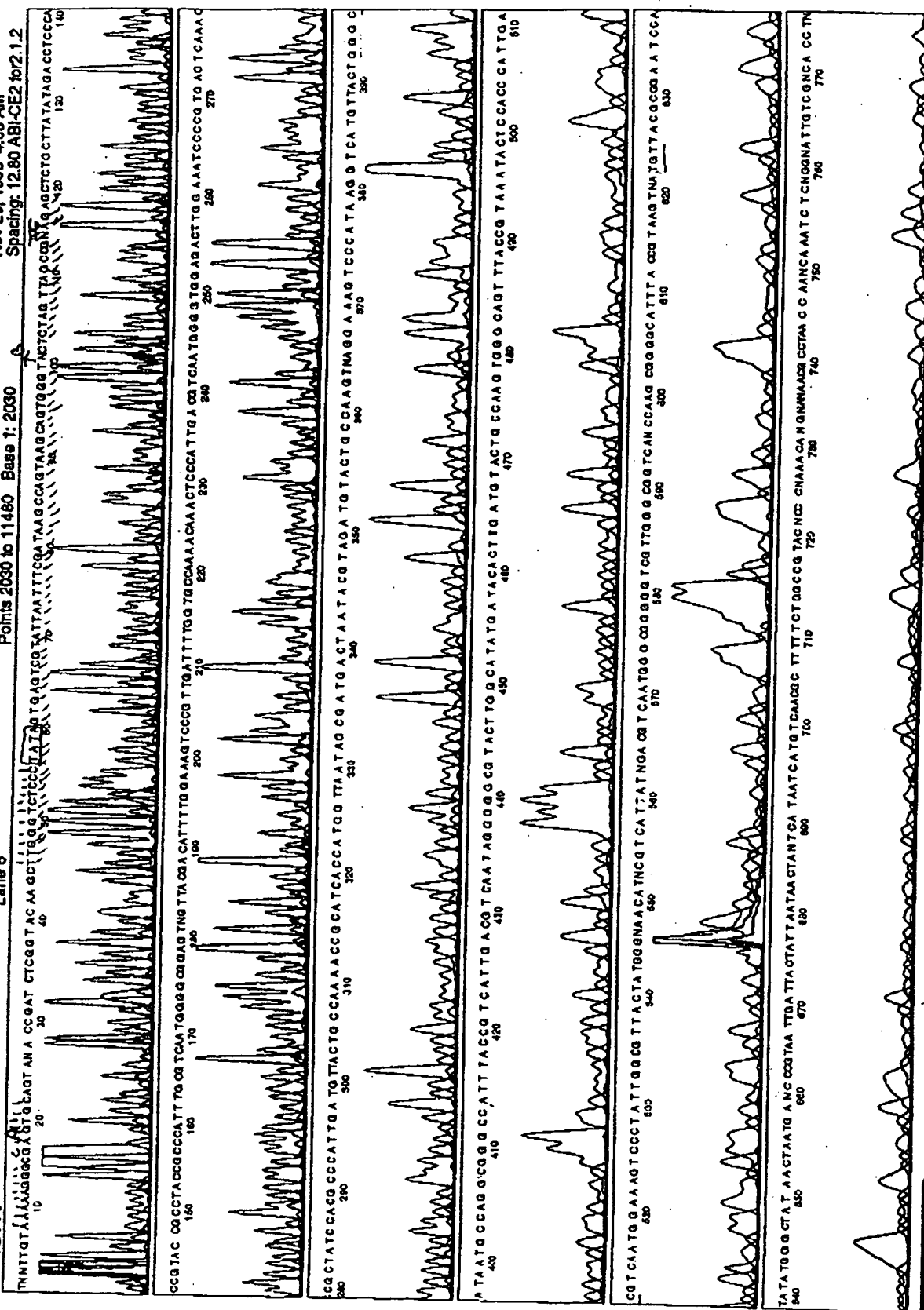


Figure 6

Nov 26, 1996 9:54 AM  
Nov 26, 1996 6:57 AM  
Spacing: 12.96 ABI-CE2

**POP8DT.Matrix**

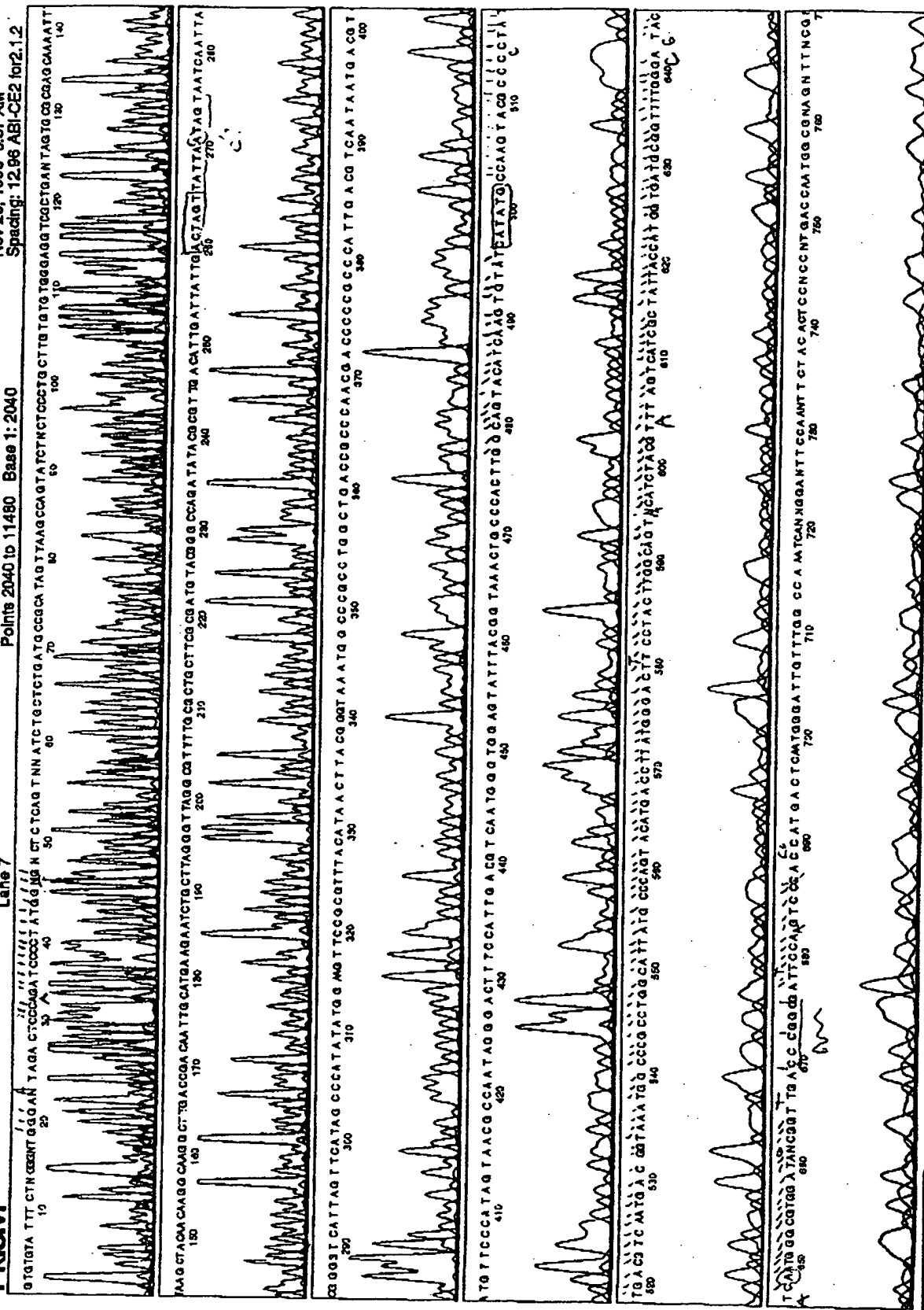
Points 2040 to 11480 Base 1: 2040

84-004

**Model 310**  
**Version 2.1.2**



12X, clade 23, primer (C) 11.



EXHIBIT

\_\_\_\_\_

76







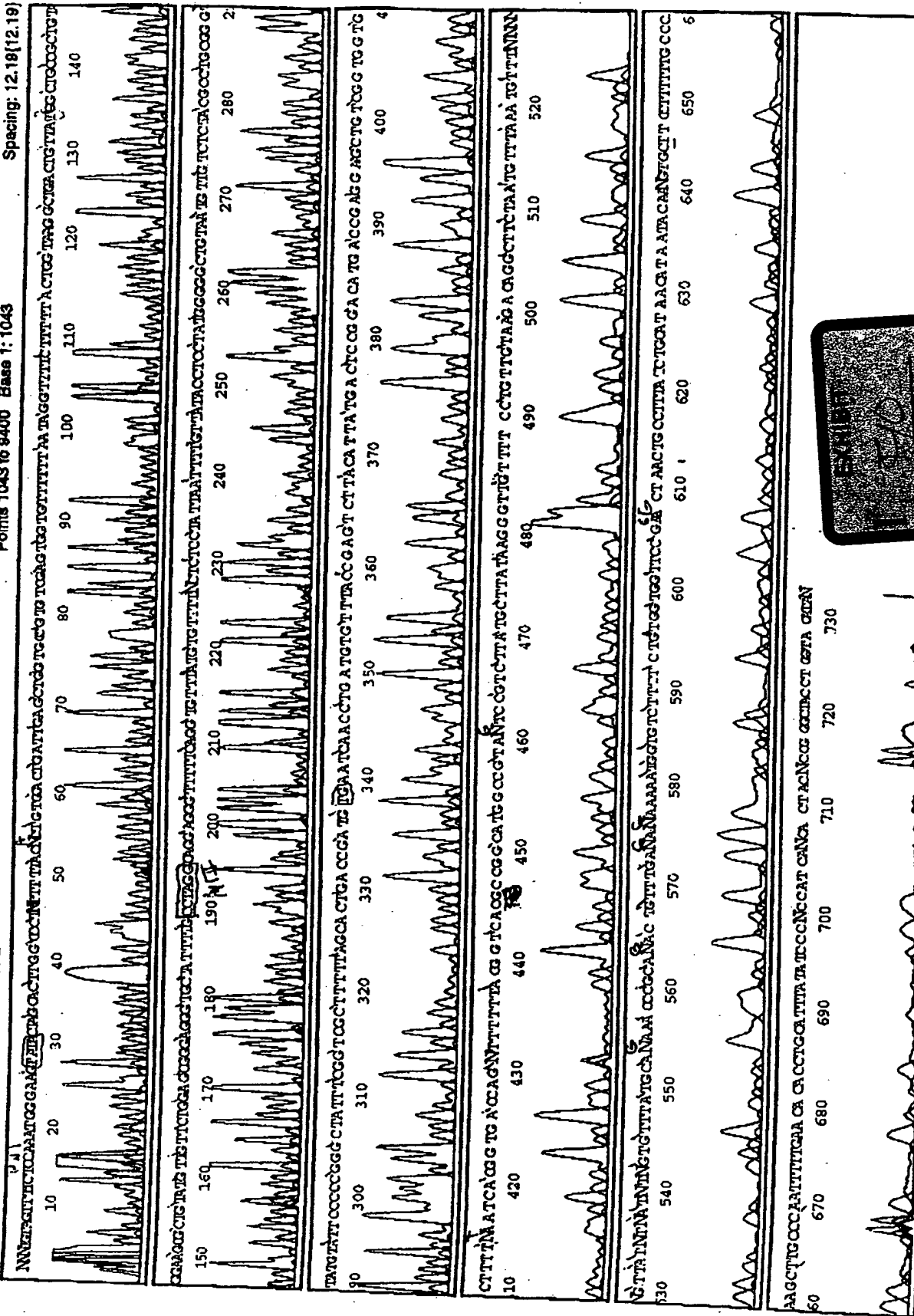


**ABI PRISM**  
Model 310  
Version 3.0  
ABI-CF2 3.0  
Version 3.0b1

A3-Wold-10  
Wold-10  
Lane 2

Signal G:638 A:658 T:543 C:294  
DT POP6  
pop6 dt-seprte-stds.mtx  
Points 1043 to 9400 Base 1: 1043

Page 1 of 1  
Thu, Mar 20, 1997 10:22 PM  
Thu, Mar 20, 1997 7:47 PM  
Spacing: 12.19(12.19)

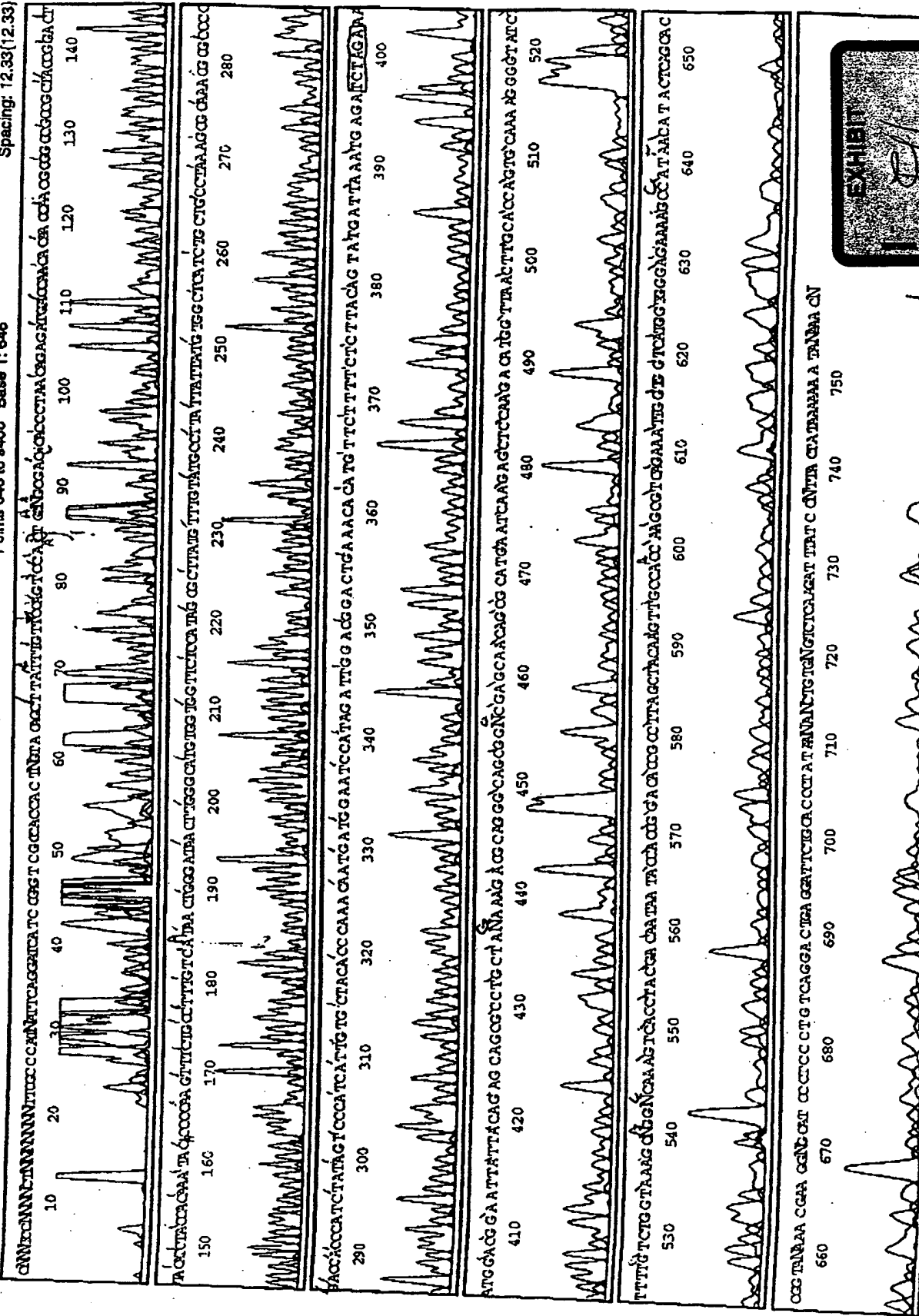


**ABI PRISM**  
Model 310  
Version 3.0  
ABI-CE2 3.0  
Version 3.0b1

A5-Wold-11  
Wold-11  
Lane 3

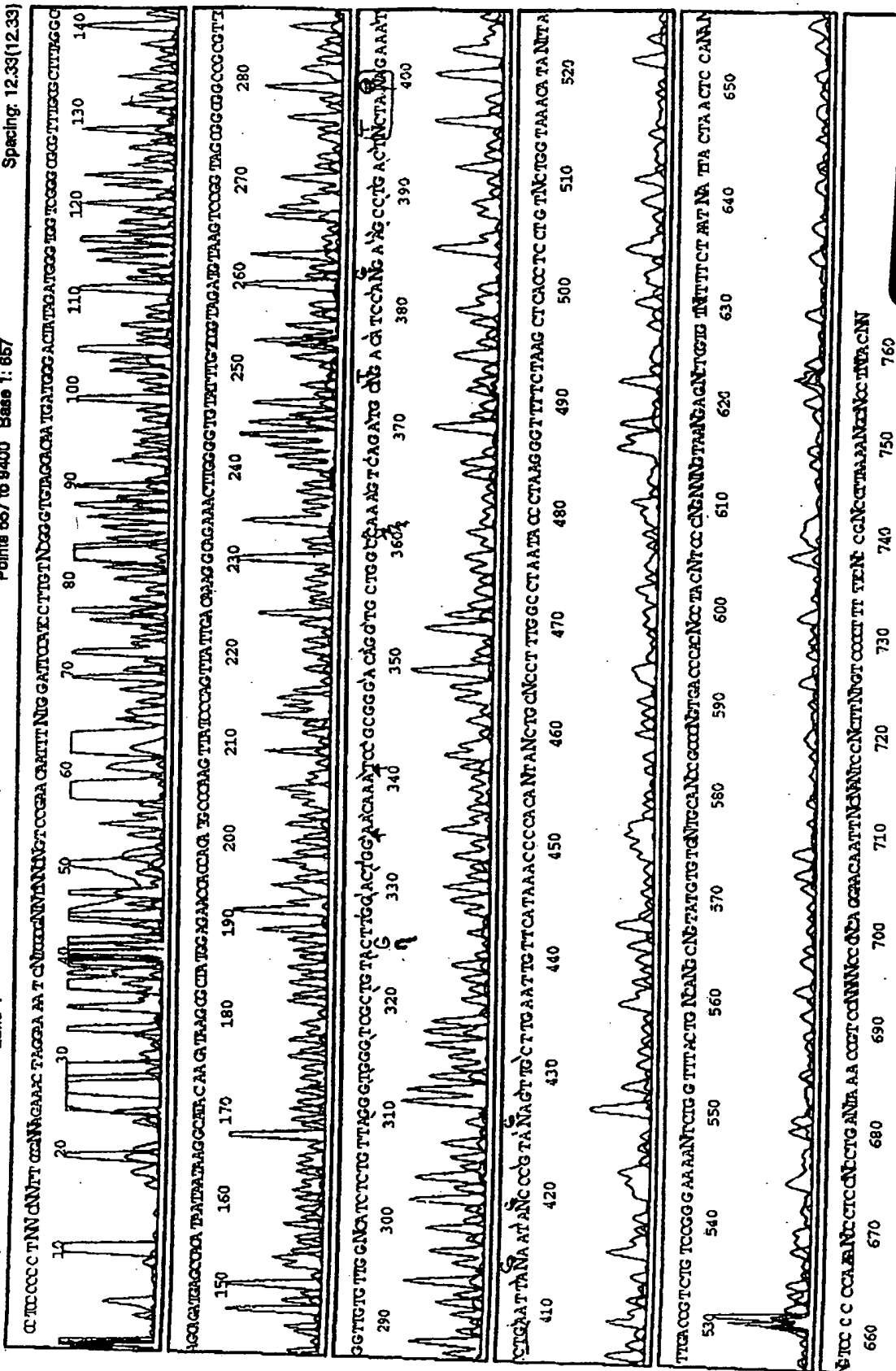
Signal G:278 A:419 T:211 C:190  
DT POP8  
pop8 dt-seprie-stds.mtx  
Points 648 to 8400 Base 1: 646

Page 1 of 1  
Fri, Mar 21, 1997 12:57 AM  
Thu, Mar 20, 1997 10:22 PM  
Spacing: 12.33(12.33)



Signal G:251 A:255 T:160 C:128  
DT POP6  
pop6 dt-sep1re-stds.mtx  
Points 657 to 940 Base 1: 657

Page 1 of 1  
Fri, Mar 21, 1997 3:32 AM  
Fri, Mar 21, 1997 12:57 AM  
Spacing: 12.33(12.33)



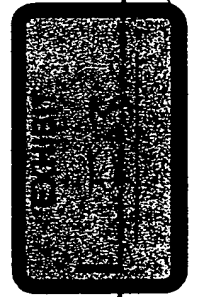
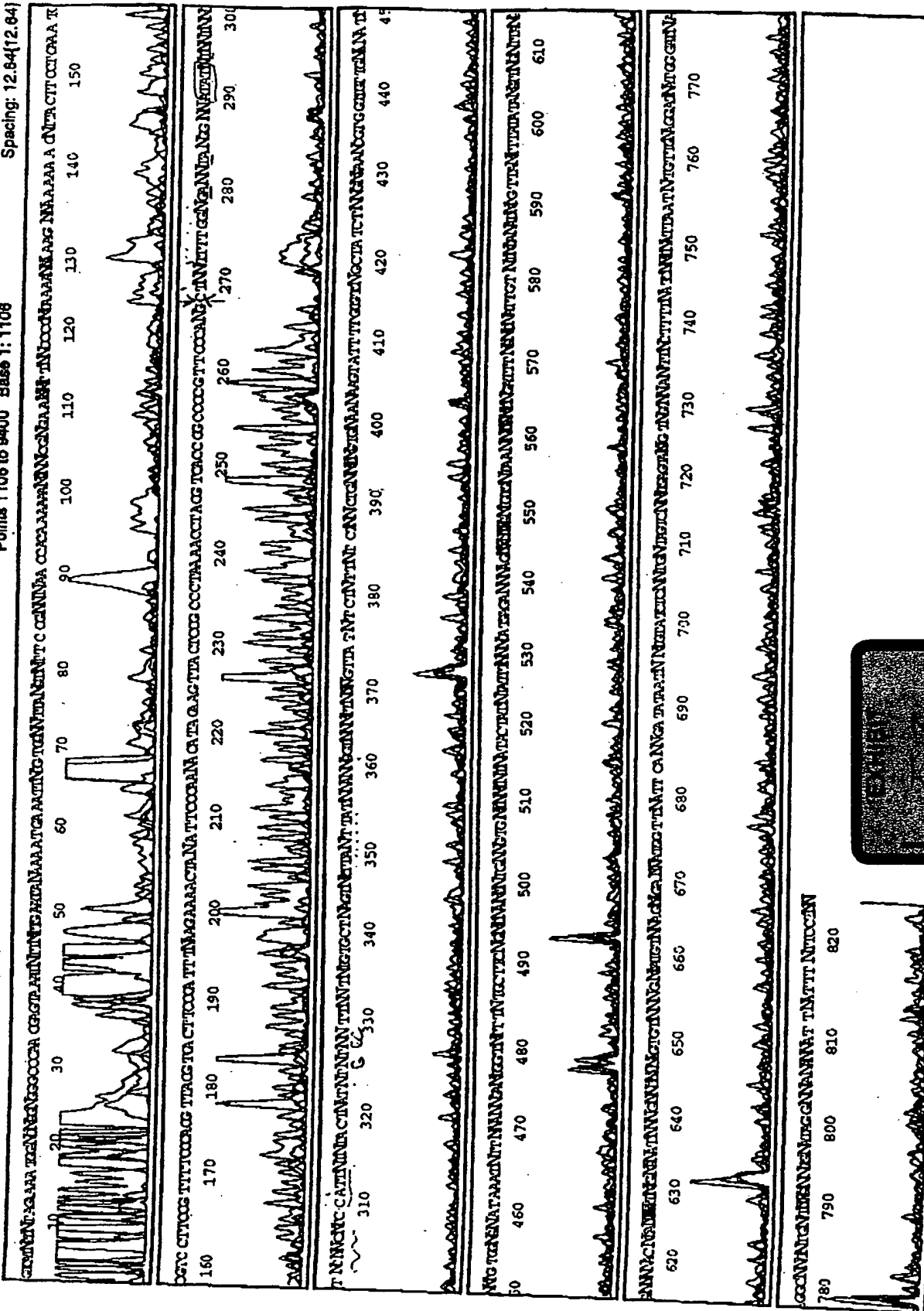
一、**EX**

**ABI PRISM**  
Model 310  
Version 3.0  
ABI-CE2 3.0  
Version 3.0b1

A1-Kostya/Wold-14  
Kostya/Wold-14  
Lane 1

Signal G:71 A:84 T:75 C:57  
DT POP8  
pop8 dt-esprit-sids.mtx  
Points 1106 to 8400 Base 1: 1106

Page 1 of 1  
Mon, Apr 21, 1987 12:49 PM  
Mon, Apr 21, 1987 9:22 AM  
Spacing: 12.84(12.64)



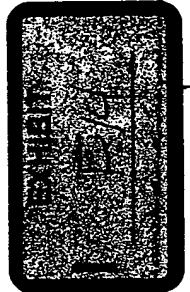
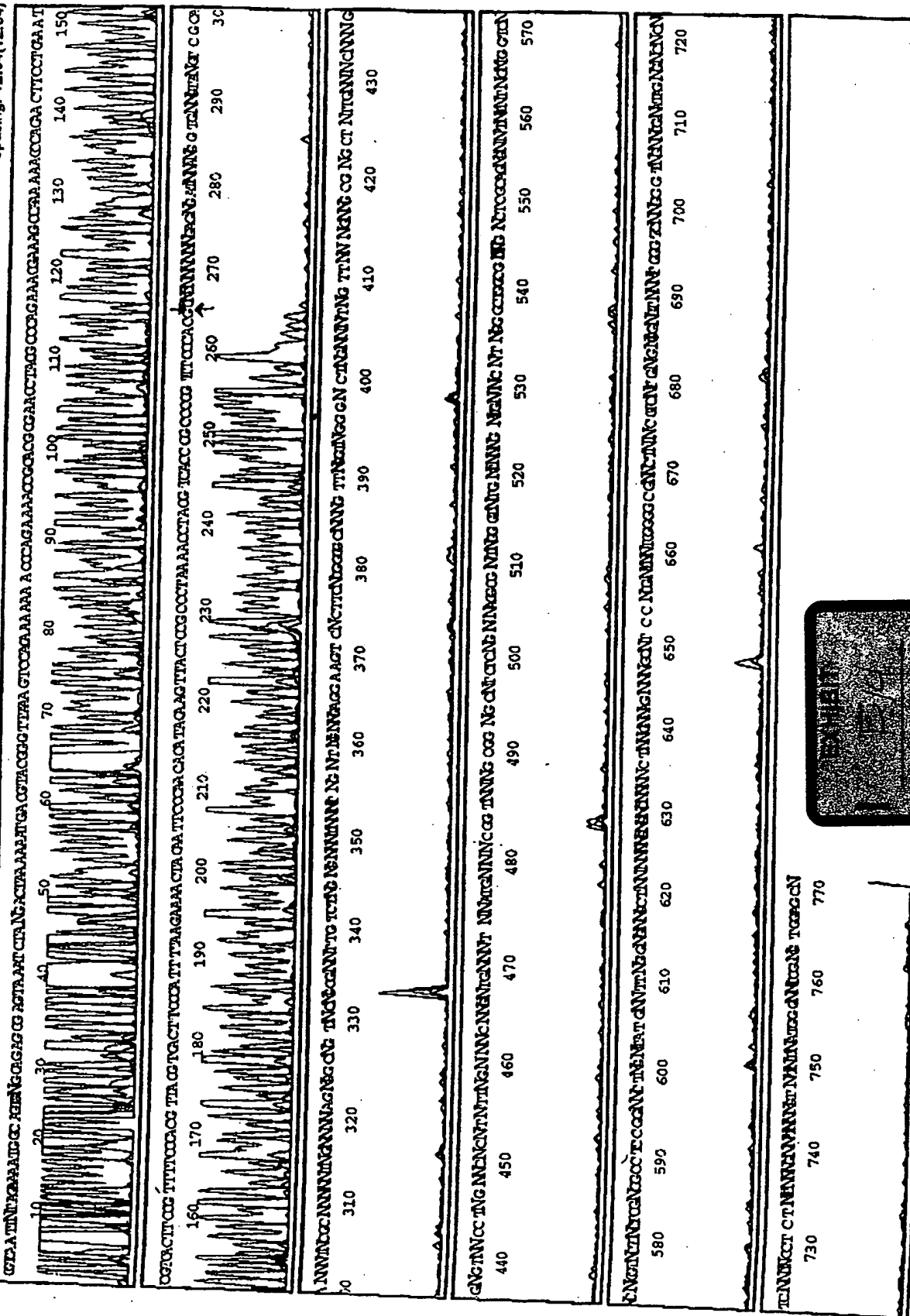
**ABI PRISM**  
Model 310  
Version 3.0  
ABI-CE2 3.0  
Version 3.0b1

A3-Kostya/wold-15  
Kostya/wold-15  
Lane 2

PKC(0)  
primer 10.

Signal G:151 A:330 T:175 C:161  
DT POP8  
pop8 dt-sepnte-stds.mtx  
Points 1081 to 8400 Base 1: 1081

Page 1 of 1  
Mon, Apr 21, 1997 2:42 PM  
Mon, Apr 21, 1997 12:07 PM  
Spacing: 12.64(12.64)

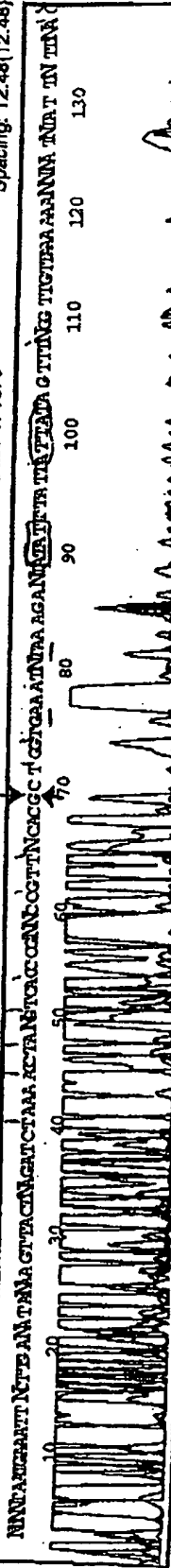


Model 310  
Version 3.0  
ABI-CE2 3.0  
Version 3.0b1

Signal G:99 A:145 T:99 C:92  
DT POP8  
pop8 di-seprte-stds.mtx  
Points 1079 to 8400 Base 1: 1078

Page 1 of 1  
Mon, Apr 21, 1997 5:18 PM  
Mon, Apr 21, 1997 2:42 PM  
Spacing: 12.48(12.48)

179m's Bally Carg  
A5-Kostya/wold-16  
Kostya/wold-16  
Lane 3



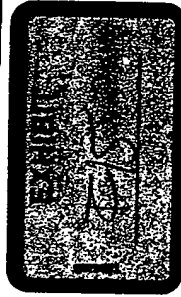
140 150 160 170 180 190 200 210 220 230 240 250 260 270

280 290 300 310 320 330 340 350 360 370 380 390 400 410 420

430 440 450 460 470 480 490 500 510 520 530 540 550 560

570 580 590 600 610 620 630 640 650 660 670 680 690 700 710

720 730 740 750 760 770 780



800 810 820 830 840 850 860 870 880 890 900 910 920 930 940 950 960 970 980 990





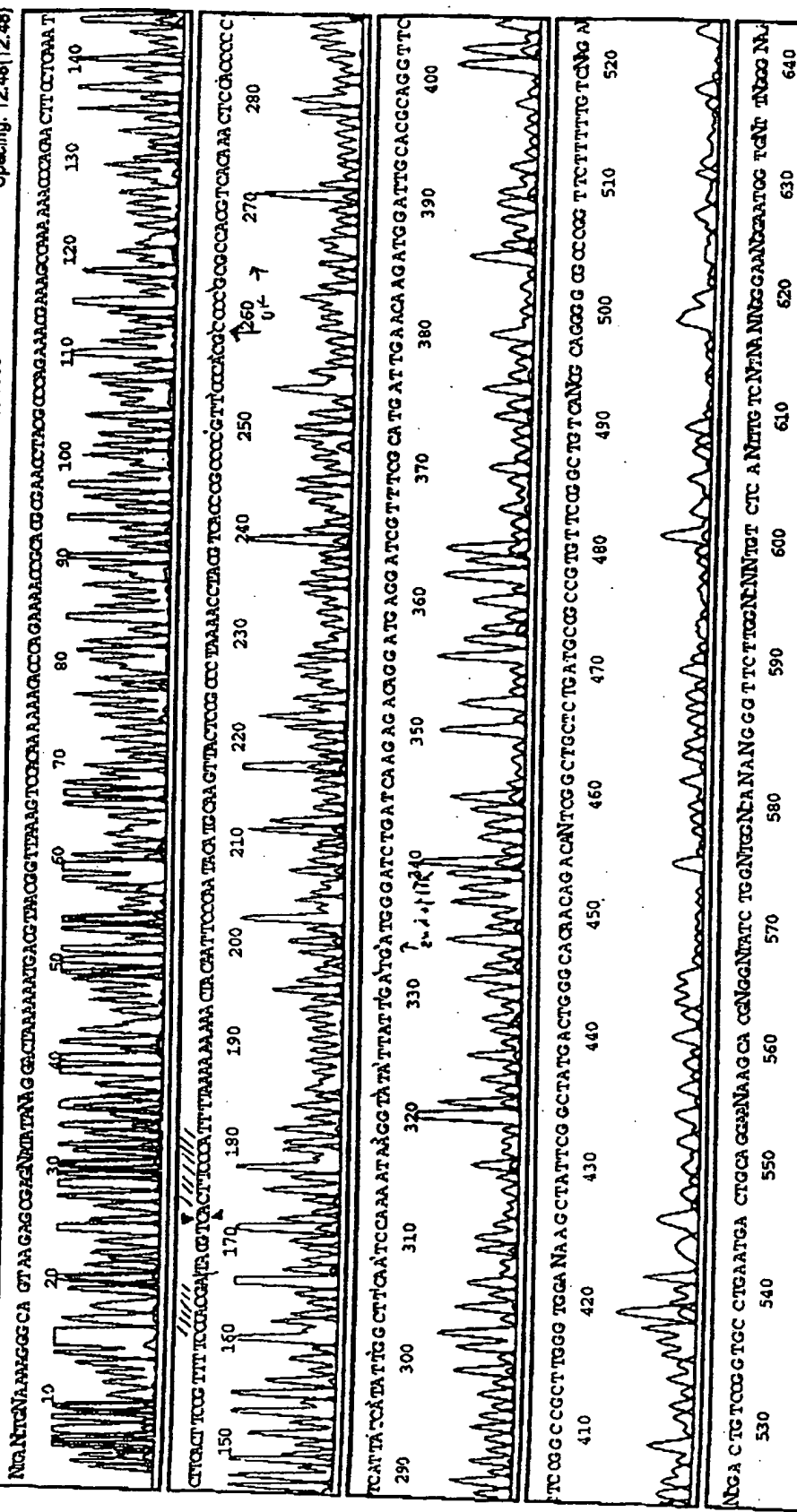
Model 310  
Version 3.0  
ABI-CE2 3.0  
Version 3.0b1

Lane 5

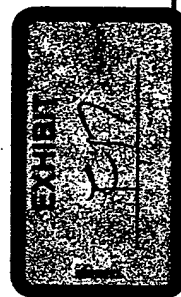
Points 1095 to 9400 Base 1:1095

Page 1 of 1  
Mon, Apr 21, 1997 10:27 PM  
Mon, Apr 21, 1997 7:52 PM  
Spacing: 12.48(12.48)

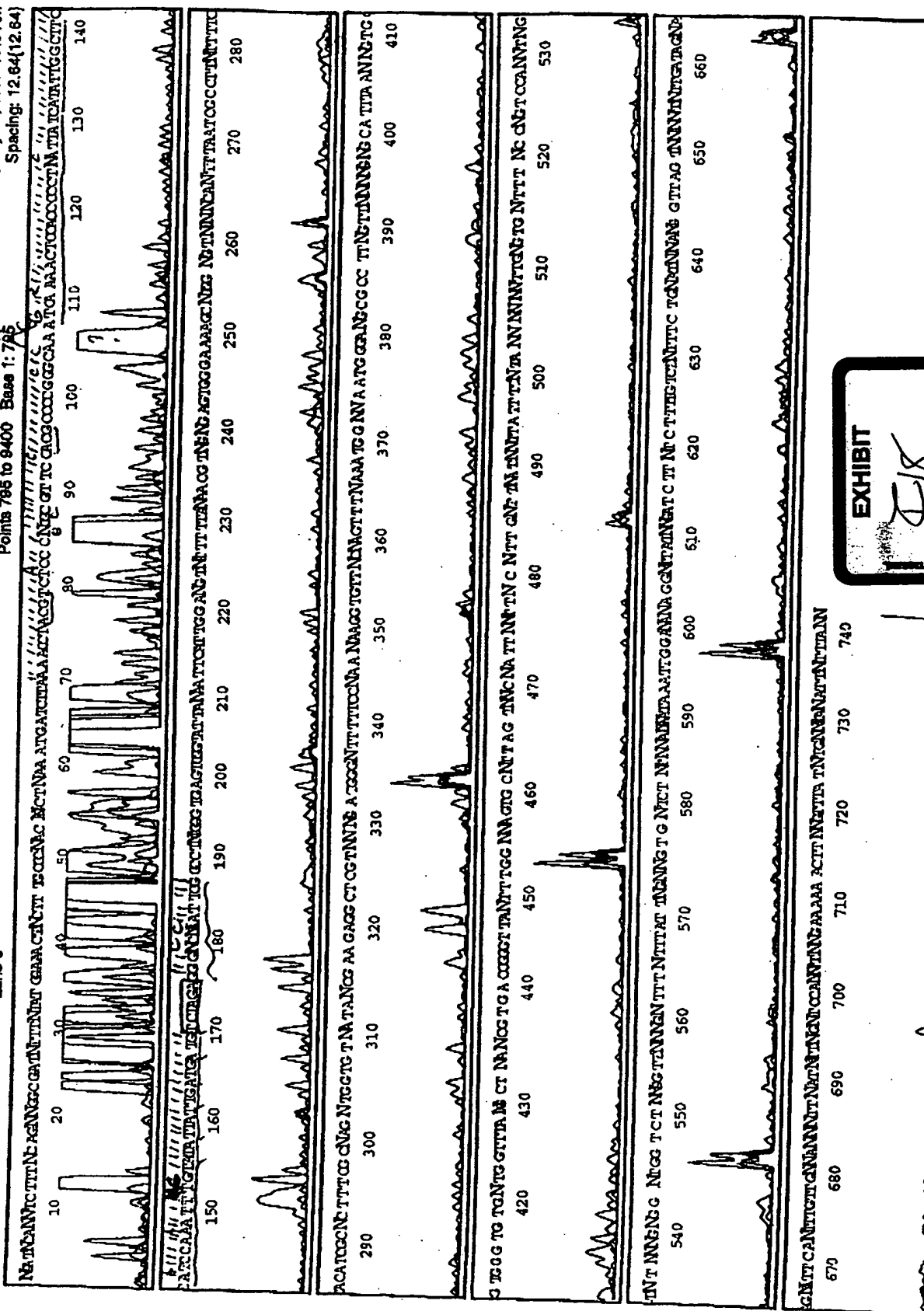
Page 1 of 1  
Mon, Apr 21, 1997 10:27 PM  
Mon, Apr 21, 1997 7:52 PM  
Spacing: 12.48(12.48)



NTGCGCGGNNGATTCNCTNCCNNNNNNCNGNNNANANGNNNNN

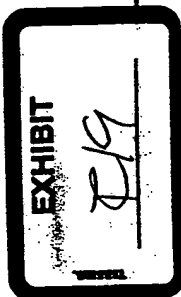


Page 1 of 1  
Mon, May 12, 1997 10:24 AM  
Mon, May 12, 1997 7:49 AM  
Spacing: 12.64(12.64)



**EXHIBIT**

Mon, May 12, 1997 1:00 PM  
Mon, May 12, 1997 10:24 AM  
Spacing: 12.19(12.19)



**ABI PRISM**  
Model 310  
Version 3.0  
ABI-CE1  
Version 3.0

Donorin #1

Donorin #1  
Lane 5

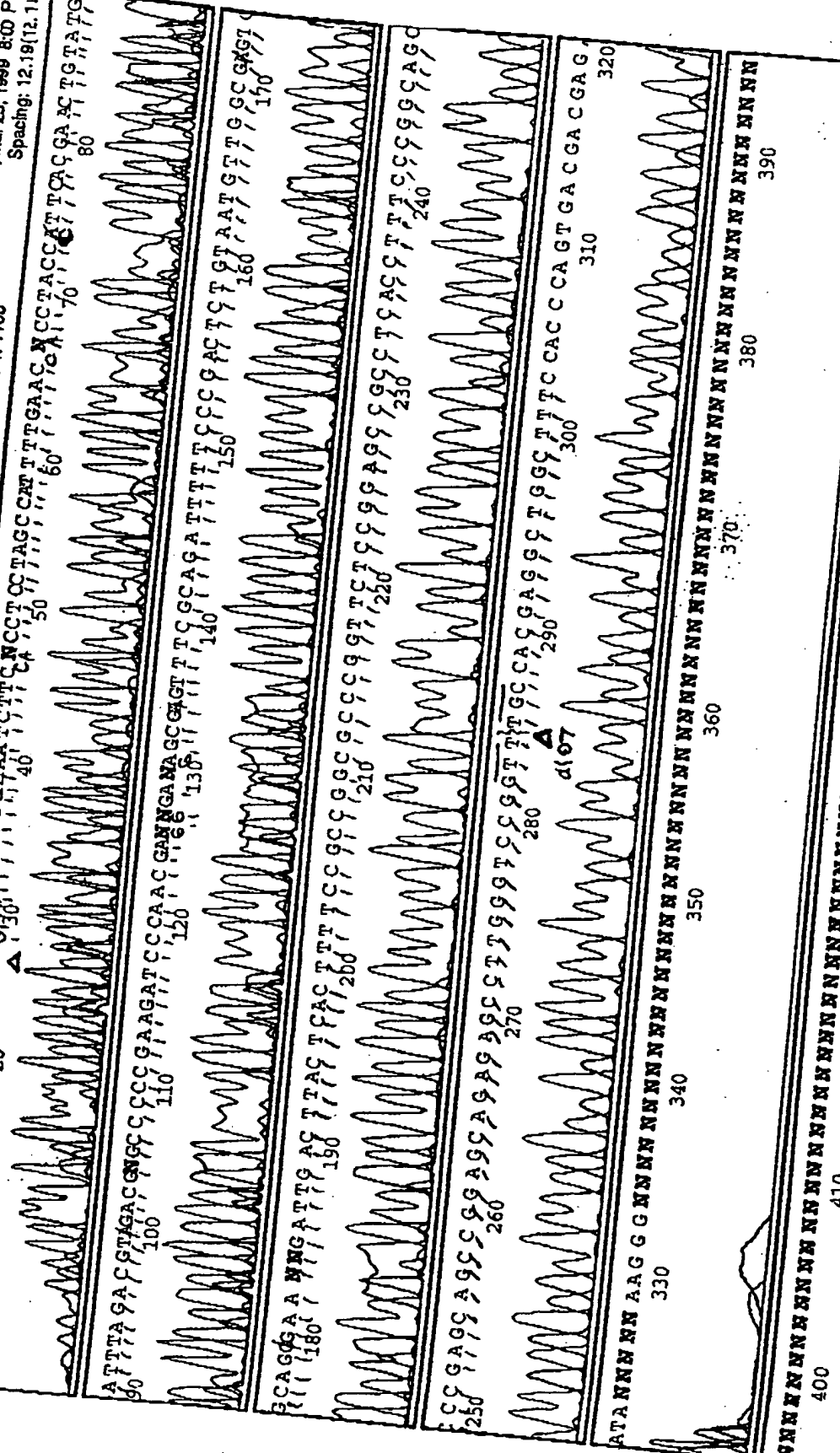
PCR product  
110/1107 4318-19

Sequence primer 018 (direct)  
DT POP8(BD Set-Any Primer)  
dRhod2

Signal G:1955 A:1498 T:1255 C:1906

Page 1 of 1  
Tue, Mar 23, 1999 10:45 P  
Tue, Mar 23, 1999 8:00 P  
Spacing: 12.19/12.115

GTGTCGCCCGGAGTGAATGAGATGAGTCTGGCTGGTAACTCTTCACCTAGCCCTTTGAACCTACCTTACGACCTGATG  
10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400 410 420 430 440 450 460



**EXHIBIT**  
1  
F20

Page 1 of 2  
Wed, Mar 24, 1999 1:30 AM  
Tue, Mar 23, 1999 10:45 PM  
Spacing: 12.04(12.24)



24



**ABI**  
**PRISM™**

Doronin #6  
Doronin #8  
Lane 10

per product w3, w9 (8-19 Signal G:2810 A:2515 T:2051 C:2487  
Sequence == primer w3) 19 (w9) dRhod2 DT POP6(BD Set-Any Primer)  
Plate 1094 to 8440 Base 1: 1094

Page 1 of 2  
Wed, Mar 24, 1999 12:09 PM  
Wed, Mar 24, 1999 9:45 AM  
Spacing: 12.04(12.04)





Page 1 of 2  
24, 1999 8:01 PM  
Wed, Mar 24, 1999 5:15 PM  
Spacing: 12.04(12.04)

[illegible]

970619 Infection of A549 (Kostyn's Virus)A549 (6/18) "1-40" - ~80% confl. (estimate  $10^6$  cells/TP)

Added SF-DME (2ml), removed &amp; added 1ml SF-DME (~11Am);

Infection at 2:30 pm

<u>Virus</u>	<u>#rep</u>	<u>Titer</u>	<u>Inf'g Volume</u> <u>(1:20 dilution)</u>	<u># TP</u>
① mock	—	—	—	1
② dl 309 (VS 119) (970308)	—	$1.2 \times 10^{11}$	10 $\mu$ l/TP	4
③ KD-1 <sup>(1101/1107)</sup> ADP (970508)	—	$9.64 \times 10^{10}$	15 $\mu$ l/TP	4
④ KD-2 (970611)	—	estim $4.5 \times 10^{10}$	20 $\mu$ l/TP	4
⑤ KD-3 970617; <sup>~15me</sup> 32g sup 150cm <sup>2</sup> flask	—	estimated $2.3 \times 10^{10}$	{ 25 $\mu$ l/TP 40 $\mu$ l/TP	3 1 (Ara-C TP)

Added  $1\frac{1}{2}$  ml DME (10% FCS) at 3:30pm.

Added 4X Ara-C<sup>(10 $\mu$ l of stock)</sup> at ~6 pm & again at 9 AM on (6/20), fixed Ara-C & one set of coverslips at 27h post-infn (other 4's fixed at 49 hours post-infection  $\rightarrow$  all fixed in Paraformaldehyde followed by MeOH/DAPI, then a 2 min MeOH rinse & rehydrated in PBS; stained on (6/23) [after checked out Baolings antibodies]



970623

## Immunofluorescence Staining

all fixed in PF/meth w DAPI

Set #1

(M73(1:2)  
121531 (1:100, find)600  $\mu$ l

- 1 mock (Ara-C) slight backgrd (all c. Ab)
- 2 dl 309 (Ara-C) 400% inf'd; some Golgi
- 3 dl 309 (27h) Golgi + speckled around nuclei
- 4 KD-1 (Ara-C) 80-90% inf'd; some Golgi
- 5 KD-1 (27h) much more than Ad5; some Golgi
- 6  $\downarrow$  (49h) all cells bright (all vesicular)
- 7 KD-2 (Ara-C) 70-80% inf'd; some Golgi
- 8  $\downarrow$  (27h) more like Ad5, but some nuclei
- 9  $\downarrow$  (49h) more diffuse; some cells quite bright; some Golgi
- 10 KD-3 (Ara-C) 50-60% inf'd; to Ad5 (49h)
- 11  $\downarrow$  (27h) not too much staining
- 12  $\downarrow$  (49h) some cells brighter (again rather "diffuse")

Set #2 ( $\alpha$ DBP /  $\alpha$ Fib, each)250  $\mu$ l

- 13 mock (49h) slight backgrd (esp. FITC)
- 14 309 (27h) no all nuclei stain for both
- 15 KD-1 (49h) strong staining for both
- 16 KD-2  $\downarrow$  more stained for DBP
- 17 KD-3  $\downarrow$  fewer cells stained for Fib

A-549 (6/18) 1:40 (p100) - Inf'd (6/19)

volume of 1:  $\alpha$ 2: 309 (10  $\mu$ l), KD-1 (15  $\mu$ l), KD-2 (20  $\mu$ l), KD-3 (40  $\mu$ l (Ara-C), or 25  $\mu$ l)1st Ab(s): 50  $\mu$ l for 60 minutes;

PBS rinses: 70 min, 12 min;

2nd Ab(s): Goat  $\alpha$  rabbit FITC  $\rightarrow$  Goat  $\alpha$  mouse-RITC (not preadsorbed)  
 1:50 dilution of each  
 50  $\mu$ l for 34 minutes;

PBS rinses: 6 1/2 min, 5 min;  
 dd H<sub>2</sub>O dip  
 mounted in Elvanol w p-phenylenediamine

EXHIBIT

#2

# 970(5/20) Plaque Assays (New Counts)

Virus	Dilution	Dish	5/26	5/28	5/30	1/2	1/4	1/6	1/8
① dl751	$.5 \times 10^{-8}$	A	76	74	Tmtc	→			
		B	65	66	Tmtc	→			
	$.5 \times 10^{-9}$	A	10	12	10	9	0	0	0
		B	5	6	bad.	5	0	0	Tmtc
		C	4	6	10	10	2	0	2
	$.5 \times 10^{-10}$	A	2	0	2	3	0	0	0
		B	0	0	0	0	0	0	0
		C	1	0	1	0	0	0	0
	$.5 \times 10^{-8}$	A	10	37	13	30	31	10	Tmtc
		B	6	37	15	17	26	11	Tmtc
	$.5 \times 10^{-9}$	A	3	3	2	2	2	5	0
		B	0	6	0	2	5	3 <sup>(bad)</sup>	bad
		C	0	2	0	0	12	9	2
② dl707 (4/23/97)	$.5 \times 10^{-10}$	A	0	0	0	0	1	0	0
		B	0	0	0	0	0	0	0
		C	0	0	3	0	1	0	0
	$.5 \times 10^{-8}$	A	16	41	14	68	Tmtc	19	→
		B	44	51	15	47	Tmtc	28	→
	$.5 \times 10^{-9}$	A	2	2	2	8	13	3	0
		B	1	8	5	2	8	5	2
		C	0	2	2	9	14	6	2
	$.5 \times 10^{-10}$	A	0	0	0	0	1	0	0
		B	0	0	0	0	0	1	0
		C	0	0	0	0	0	3	0
	$.5 \times 10^{-8}$	A	16	41	14	68	Tmtc	19	→
		B	44	51	15	47	Tmtc	28	→
	$.5 \times 10^{-9}$	A	2	2	2	8	13	3	0
		B	1	8	5	2	8	5	2
		C	0	2	2	9	14	6	2
③ dl707 (3/15/97)	$.5 \times 10^{-10}$	A	0	0	0	0	1	0	0
		B	0	0	0	0	0	1	0
		C	0	0	0	0	0	3	0
	$.5 \times 10^{-8}$	A	16	41	14	68	Tmtc	19	→
		B	44	51	15	47	Tmtc	28	→
	$.5 \times 10^{-9}$	A	2	2	2	8	13	3	0
		B	1	8	5	2	8	5	2
		C	0	2	2	9	14	6	2
	$.5 \times 10^{-10}$	A	0	0	0	0	1	0	0
		B	0	0	0	0	0	1	0
		C	0	0	0	0	0	3	0

EXHIBIT

#4

# 970520 Plaque Assays

Virus	Dilution	Dish	5/26	5/28	5/30	6/2	6/4	6/6	6/8
④ PmE	$.5 \times 10^{-8}$	<del>A</del>	42	80					
		A	<del>37</del>	<del>102</del>	74	TmTC			→
	$.5 \times 10^{-9}$	B	37	102	78	TmTC			→
		A	1	8	16	12	4	0	TmTC
	$.5 \times 10^{-10}$	B	7	17	11	14	1	0	TmTC
		C	7	15	20	7	11	0	TmTC
		A	0	0	4	1	2	1	2
		B	0	0	3	0	1	0	0
		C	0	2	2	2	0	2	0
⑤ KP	$.5 \times 10^{-8}$	A	TmTC						→
		B	TmTC						→
	$.5 \times 10^{-9}$	A	20	8	8	3	5	0	0
		B	37	7	2	1	2	0	0
		C	24	11	11	1	0	0	0
	$.5 \times 10^{-10}$	A	2	0	1	1	1	2	0
		B	0	1	0	0	0	1	0
		C	5	0	0	2	1	2	0

EXHIBIT

45

Cumulative Counts

970(5/20) Plaque Assays

Virus	Dilution	Dish	5/16	5/28	5/30	6/2	6/4	6/6	6/8
① dl751	$.5 \times 10^{-8}$	A	76	150	TMTc	→			
		B	65	131	TMTc	→			
	$.5 \times 10^{-9}$	A	10	22	32	41	41	41	41
		B	5	11	11	16	16	16	16
		C	4	10	20	30	32	32	34
	$.5 \times 10^{-10}$	A	2	2	4	7	7	7	7
		B	0	0	0	0	0	0	0
		C	1	1	2	2	2	2	2
			22	46	69	96	98	98	100
② dl707 (4/23/97)	$.5 \times 10^{-8}$	A	10	47	60	90	121	131	TMTc
		B	6	43	58	75	101	112	TMTc
	$.5 \times 10^{-9}$	A	3	6	9	11	13	18	18
		B	0	6	6	9	14	17	17
		C	0	2	2	2	14	23	25
	$.5 \times 10^{-10}$	A	0	0	0	0	1	1	1
		B	0	0	0	0	0	0	0
		C	0	0	3	3	4	4	4
			3	14	20	25	46	63	65
③ dl707 (3/15/97)	$.5 \times 10^{-8}$	A	16	57	71	139	TMTc	→	
		B	44	95	110	157	TMTc	→	
	$.5 \times 10^{-9}$	A	2	4	6	14	27	30	30
		B	1	9	14	16	24	29	31
		C	0	2	4	13	27	33	35
	$.5 \times 10^{-10}$	A	0	0	0	0	1	1	1
		B	0	0	0	0	0	1	1
		C	0	0	0	0	0	3	3
			3	15	24	43	79	97	101

EXHIBIT

H6

# 970520 Plaque Assays

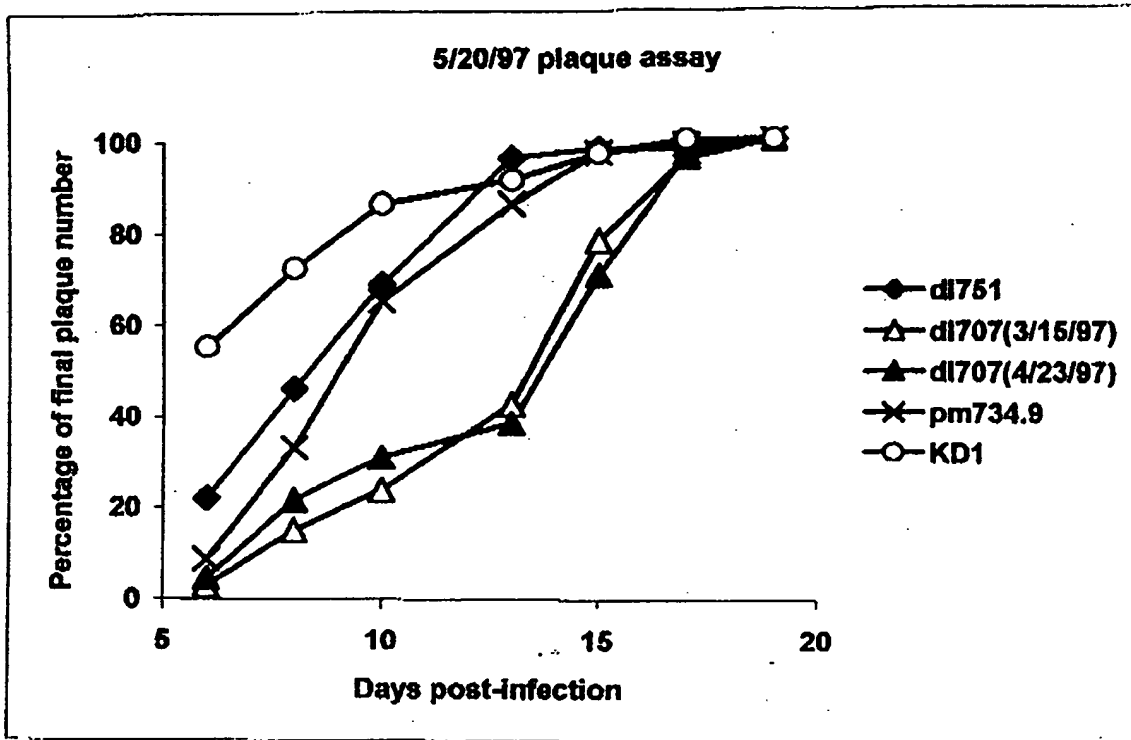
Virus Dilution	Dish	5/26	5/28	5/30	6/2	6/4	6/6	6/8
④ PmE $.5 \times 10^{-8}$	<del>A</del>							
	A	42	122	196	TmTC			→
	B	37	139	217	TmTC			→
	$.5 \times 10^{-9}$ A	1	9	25	37	41	41	TmTC
		B	7	24	35	49	50	TmTC
		C	7	22	42	49	60	TmTC
	$.5 \times 10^{-10}$ A	0	0	4	5	7	8	10
		B	0	0	3	3	4	4
		C	0	2	4	6	8	8
		15	57	113	149	168	171	173
⑤ KD $.5 \times 10^{-8}$	A	TmTC						→
	B	TmTC						→
	$.5 \times 10^{-9}$ A	20	28	36	39	44	44	44
		B	37	44	46	47	49	49
		C	24	35	46	47	47	47
	$.5 \times 10^{-10}$ A	2	2	3	4	5	7	7
		B	0	1	1	1	2	2
		C	5	5	5	7	8	10
		88	115	137	145	154	159	159

EXHIBIT

#7

## 970520 plaque assay\*

	6	8	10	13	15	17	19
dl751	22	48	69	96	98	98	100
dl707(3/15/97)	3	14.9	23.8	42.6	78.2	96	100
dl707(4/23/97)	4.6	21.5	30.8	38.5	70.8	96.9	100
pm734.9	8.7	32.9	65.3	86.1	97.1	98.8	100
KD1	55.3	72.3	86.2	91.2	96.9	100	100



\*numbers at the top of the page are the data points represented in the graph

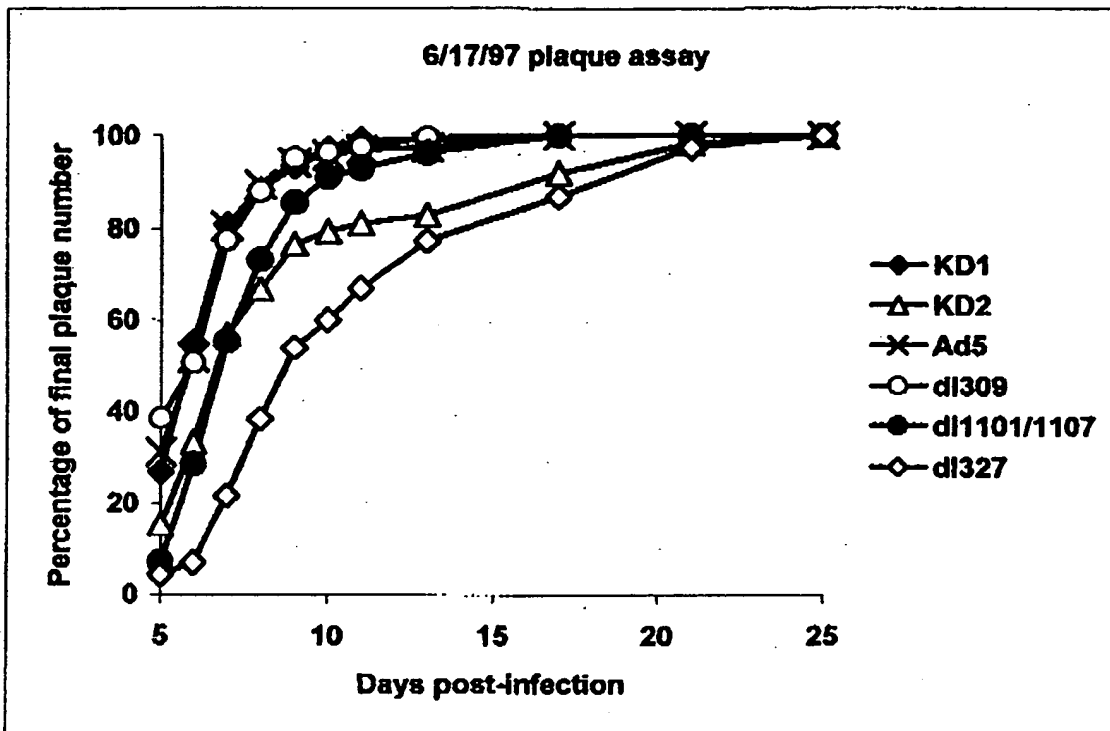
EXHIBIT

48



## 970520 plaque assay\*

	5	8	7	8	9	10	11	13	17	21	25
KD1	27	55.2	80.9	88.4	93.4	97.1	99.2	99.2	100	100	100
KD2	15.3	33.3	56.8	66.7	76.6	79.3	81.1	82.9	91.9	98.2	100
Ad5	31.2	51.9	80.6	89.5	94.1	95.8	97	97.5	100	100	100
dl309	38.5	50.8	77.5	88.1	95.1	96.3	97.5	99.6	100	100	100
dl1101/1107	7.1	28.6	55.4	73.2	85.7	91.1	92.9	96.4	100	100	100
dl327	4.3	7	21.7	38.3	53.9	60	67	77.4	87	97.4	100



\*numbers at the top of the page are the data points represented in the graph



(7/26) Blue

(5/28) Green

H6

970526

(5/20) Plaque Assays

<u>Virus</u>	<u>Dilution</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Comments</u>
① dl 751	$.5 \times 10^{-8}$ $.5 \times 10^{-9}$ $.5 \times 10^{-10}$	76+74 10+12 2+0	65+66 5+6 0°	<del>4+6 1+0</del>	quite large + very distinct
② dl 707 (4/23)	$.5 \times 10^{-8}$ $.5 \times 10^{-9}$ $.5 \times 10^{-10}$	10+37 3+3 0°	6+37 0+6 0°	<del>0+2 0°</del>	small, flat + very indistinct
③ dl 707 (3/15)	$.5 \times 10^{-8}$ $.5 \times 10^{-9}$ $.5 \times 10^{-10}$	16+41 2+2 0°	44+51 1+8 0°	<del>0+2 0°</del>	Flat + <u>indistinct</u>
④ PME	$.5 \times 10^{-8}$ $.5 \times 10^{-9}$ $.5 \times 10^{-10}$	46+80 1+8 0°	37+102 7+17 0°	<del>7+15 0+2</del>	fairly large + quite distinct
⑤ KP	$.5 \times 10^{-8}$ $.5 \times 10^{-9}$ $.5 \times 10^{-10}$	TNTC 20+8 2+0	TNTC 37+7 0+1	<del>24+11 5+0</del>	small to large all distinct; "cleared" center in many plaques (all cells lysed?)
⑥ mock	—	0	0	<del>X</del>	

AT Counts + descriptions

(5/20) Plaque Assay

Comments most likely done on  
15/1/1

EXHIBIT

4/10

# Analysing the infectivity of the viruses 1101/1107 and d1309 on Growth arrested and growing cells.

cell line = HEL 299 Human Lung embryonic.

Grown as in ATCC literature

T. 75 flask 1 from Karl,

split to 1:30 = 35 mm dish.  
1:60 = 35 mm dish. (how many)  
(for growing control)

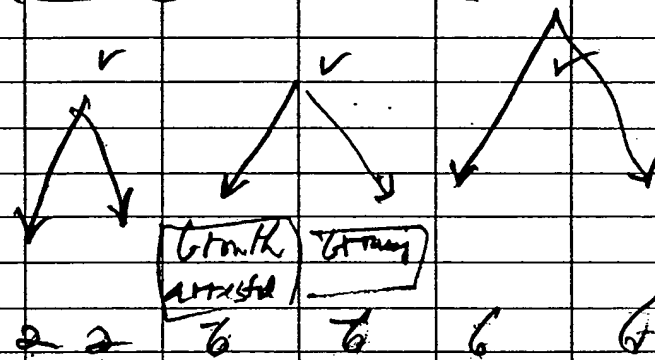
35 mm dish.

[uninfected]

[1101/1107]

[d1309]

1) 35mm + coverslip



2) 35mm + coverslip =

how many days? 6 days

↓  
titer each point 1-6 days or

EXHIBIT

I

# Analysis of the H1101/1107, H1309 viruses infectivity on Growth arrested and growing HEI 299 cells:

HEI 299 one T.7.5



35 mm dish

1:30 split for growth arrested

1:60 for growing cells

Growing growth arrested

1:12

HEI 299

[

1. Uninfected-mock

2. H101/1107 infected

3. H1309 infected

2

2

2

2

(12)



look for CPE - days?

4. On cover slip 1, 2, 3

days for Ad fiber IF.

(1+2)

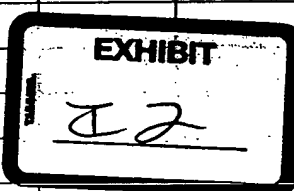
(10)

(22)

virus location

H1309 = pfu ✓

H1101/1107 = pfu ✓



HEL 299

↓ 7.75

35 mm dishes

1:30

↓

1:60

MEM; 0.1mM Non essential a.a.s; 1mM Sodium-pyruvate + 0.1% lactalbumin hydrolysate + 10% FBS

↓ 1:60

Split, count the cells + infect E  
dl 118/11071, dl 309, 100 moi

↓ 1:30

Split, allow to become confluent, then growth arrest by low serum, <sup>(3 days)</sup> then infect E dl 1101/dl 1107  
dl 309 0.27

↓

EXHIBIT

73

viral infection d1 1101/1107

- count one growing MEL 299 cells.  
- 100 pfu -

- Make 200 ml EMEM + NA Arginine, NEAA + Lactalbumin hydrolysate  
100x 100x 100x

$$\frac{116}{31} = 3.74$$
$$3.74 \times 2 = 7.48$$

$$294,000 / \text{ml}$$

d1 309 - 950111 - pfu  $2.15 \times 10^{11}$

Location  
5-7

d1 1101/1107 - from Karl - pfu  $1.95 \times 10^{11}$

from 35 mm - MEL 299 growing cells - counted - 294,000 / ml

$$100 \text{ pfu } \underline{\underline{\text{d1 309}}} = \frac{100 \times 294,000}{2.15 \times 10^6}$$

$$= \frac{294}{2.15 \times 10^4} = \frac{2.94}{2.15 \times 10^4} = 0.00013$$

= virus is too concentrated.  
Dilute to  $10^9$

10 ml dilute to 1 ml in medium (no serum) plus  
-  $2.15 \times 10^9$

EXHIBIT  
24

$$= \frac{100 \times 294,000}{2.15 \times 10^4} = \frac{294}{2.15 \times 10^4}$$

d1101/d1107 100 pfr =

~~100~~ x 294.000

294

dilute the virus to  $10^4$   
in 10  $\mu$ l to 1 ml

$1.95 \times 10^4$

$1.95 \times 10^4$

=

15 ml

12/16/96

Growing cells

2 = 35 mm dish d1309, 100 pfr

2 = 35 mm dish d1101/1107, 100 pfr

6 = 35 mm on coverslip d1101/1107 100 pfr

EXHIBIT

75

Growth arrested HEL 293 = infectious 1130g,

11101/1107

35 mm dish Medium + 0.29 F8 - 3 days

Cell counts = 341,000

$$1130g = 100 \text{ pfa} = 341 \times 10^3 \times 100$$

$$\frac{2.15 \times 10^4}{15.8} = 1.36 \times 10^3$$

$$11101 = 100 \text{ pfa} = 341 \times 10^3 \times 100$$

$$\frac{1.95 \times 10^4}{17.44} = 1.12 \times 10^3$$

12m 10 ml to 1ml  $\rightarrow 10^3$

37°C / 1hr

Medium + 0.29 F8

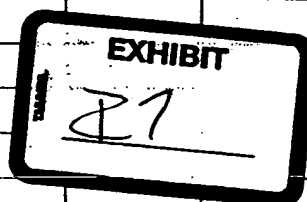
EXHIBIT

26



fixing the HEL293 cells c Methanol + DAPI<sup>(1mg/ml)</sup>  
(1µl to 1ml)  
methanol)

1. Wash the cells 2x PBS w/o
  2. Fix in Methanol (-20°C) + DAPI ~ 8 min (-20°C)
  3. Wash in Methanol w/o DAPI
  4. Wash in PBS, store at 4°C
- 
- |     |                  |          |        |                                                               |
|-----|------------------|----------|--------|---------------------------------------------------------------|
| ✓   | 1 day            | 12/11    |        |                                                               |
| ✓   | 2 day            | 12/18    |        |                                                               |
| ✓   | 3 day            | 12/19/96 | →      | DI309 started showing CPE                                     |
| ✓   | 4 day            | 12/20    | NO CPE |                                                               |
|     | 5 "              | 12/21    | NO CPE | DI309 complete CPE                                            |
|     | 6 "              |          |        |                                                               |
|     | 7 day            | 12/23    | NO CPE | ) all DI309 cells infected rounded & came off                 |
|     | 8 day            | 12/24    | NO CPE |                                                               |
|     | 9 "              | 12/25    |        |                                                               |
| →   | 10 day           | 12/26    | CPE?!  | cells looks different as DI101/1107                           |
| F   | 11               | 12/27    |        |                                                               |
| S   | 12               | 12/28    |        |                                                               |
| Sw  | 13               | 12/29    | — CPE? | starts on 12th day DI101/1107                                 |
| ✓ M | 14               | 12/30    | — CPE? | spreads - DI101/1107                                          |
|     | 15               | 12/31    | "      | "                                                             |
|     | 16               | 1/1      |        |                                                               |
| ✓   | 17               | 2/1/97   | →      | Take photographs -                                            |
|     | 18               | 3/1      | →      |                                                               |
|     | 19               | 4/1      | →      |                                                               |
|     | 20               | 5/1      | →      | almost all the cells died - DI1101/                           |
|     | 25 <sup>th</sup> | 10/1     | →      | Stain - dish, c crystal violet<br>2 - DI101/1107<br>2 - DI309 |



# Growth arrested HEL 299 cells:

Date	Days	
8	15	NO visible CPE in A1 (101) (107); some cells are floating. In normal HEL 299 cells some cells are floating but less.
9	16	same as above.
10	17	
11	18	same
12	19	cells looking different than norm
13	20	<del>HEL 299</del> But "d1309" CPE looks diff
14	21	
15	22	
16	23	" CPE??
17	24	" CPE??
18		

EXHIBIT  
18

HEL299 cells

Kodak

17 keys

7

Tmax 100  
black white printGrowing HEL 299:

1.	mock	N
2	"	+1
3	"	-1
4	"	-1
5	"	N
6	"	+1
7	41101/1107	N
8	"	+1
9	"	-1
10	"	N
11	"	+1
12	"	-1
13	"	N
14	"	+1
15	"	-1
16	"	N
17	"	+1
18	"	-1
19	"	N
20	"	+1
21	"	-1
22	"	N
23	"	+1
24	"	-1
25	"	N
26	"	+1
27	"	-1
28	"	N
29	"	+1
30	"	-1
31	"	N
32	"	N
33	"	+1
34	"	-1
35	mock	N
36	mock	+1

TMAX

EXHIBIT

29

1. ab - Filter, → 1:400 } 30'  
 DBP → 1:400  
 2. Goat anti mouse Rhodamine 1:50 (not preabsorbed)  
 Goat anti Rabbit FITC 1:25

- 1 = 1<sup>st</sup> Layer
- 2 = 2<sup>nd</sup>
- 3 = 3<sup>rd</sup>
- 4 = 4<sup>th</sup>
- 5 = 14<sup>th</sup>
- 6 = 17<sup>th</sup>
- 7 = CTRL

11101/1107

α DBP

FITC = DBP

RITC = FITC

p 47

66420

850625

α Ad2 Fiber

4D2-5

ascites fluid

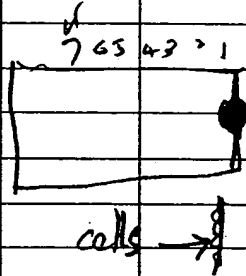
1. ab = Ad Fiber  
 = DBP

dil 1:400  
 dil 1:400

in 1 tube

35 μl / dish → 37°C / 30 min

↓ wash: 1x PBS w/o, 10 min X 3 times



2. Goat α mouse Rhodamine 1:50  
 Goat α Rabbit FITC 1:25

960/25

8 → 400  
 16 → 400

37°C  
 64  
 16

37°C / 15 min

62,

400

EXHIBIT

10

# Growth Assay

Growth arrested cells.

HE2 299

T-75 → split 15 x 35 mm dish.

# dishes same like growing

↓  
add EMEM + 0.2% FCS

↓  
3 days

↓  
infect  $\bar{c}$  [dl 1101/1102]  
pH 9.75

the control dl 309.

total dish # 27

EXHIBIT

211

HEL 299 T-25

# Growth Assay

Growing:

↓ split to 35 x 35mm dish

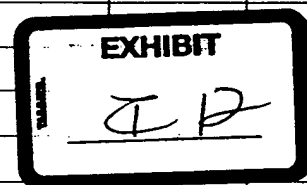
① 1 + 10 dish days (1, 4, 6, 8, 10, 12, 14, 16, 18, 20)  
d1 1101/1107

② 1 + 10 dish Same days - pm 975

↓ infect 100 pfu, freeze the dishes as days shown.

③ 4 dishes infect & d1 309 for tuel infection  
Freeze 1, 4, 6 days.

total dishes 27



1/14/98

Infection	d1 1101/1107	pfu $1.95 \times 10^{11}$
	d1 309	$2.15 \times 10^{11}$
	pm 975	$4.06 \times 10^{10}$

Growing HEL 299 cells counted: 212000/ml

① 100 pfu

For d1 1101/1107 =  $\frac{100 \times 212000}{1.95 \times 10^{11}} = \frac{2.12}{1.95 \times 10^2} = 10.8$   
 Dilute the virus to  $10^9$   
 10 ml to 1ml medium No serum

② For pm 975 =  $\frac{100 \times 2.12 \times 10^5}{4.06 \times 10^{10}} = \frac{2.12}{4.06 \times 10^2} = 5.2$   
 dilute the virus to  $10^9$   
 50 ml to 500ml serum free media

# Growth Curve

## Growing cells: Summary

(3) the CTRL

virus dil 300  $\times$  100  $\times$  2.12  $\times$  10<sup>6</sup>  
 dilute the virus to 10<sup>7</sup>  
 10  $\mu$ l to 1ml serum free media  
 $2.15 \times 10^7 \times 2$   
 $\frac{2.12}{2.5 \times 10^2} = 9.8 \mu$

1. wash the cells to PBS 4x.
2. infect in serum free media 37C / 1 hr
3. After 1hr, remove the media, wash to 1x media
4. Add MEM + 10% FCS.

Freeze the cells after

1-17-93	1 day (G1)	1/15/92 ✓
	3 day (G2)	dil 300, PM 975 shows CPE NO CPE in dil 1101/1107
1-19/93	5 (G3)	N 60% CPE in PM 975 NO CPE in dil 1101 -
	6 (G4)	PM 975 ✓ NO CPE in dil 1101
	7 (G5)	PM 975 ~100% ✓
		G3 dil 1101/1107 ~CPE? - NO
N	10	PM 975 dil 1101/1107 (NO CPE 4x) dil 300 (photos)
	15	dil 1101/1107 (morphology change CPE?)
	24	dil 1101/ G5

EXHIBIT

713

# Growing II

7

infectio		1/31/97									
		100		500		100		500		1	
		d1309		pm 975		d11101		d107		500	
Day 1		NO CPE "		NO CPE "		NO CPE "					
Day 2		Few cells		Few cells		Few cells		NO CPE			
		Tough		Tough		Tough					
Day 3		10% CPE - 20% HT		20% 50% CPE		NO CPE					
Day 6		100% CPE in		pm 975; d1309							
		NO CPE in		d11101/1107							
Day 14		—		—		500 pfm - CPE starts.					
Day 17		—		—		100 pfm - CPE starts		500 pfm - CPE +			

EXHIBIT

714



Growth Arrested

HEL 288

22/01

G1

Days

3

pm 975 - -70 C

5

pm 975, dl 1101/1107, dl 309

(photos)

7

pm 975 -70 C (photos)

10

pm 975; dl 1101/1107 (NO LPE)

(GAT)

(GAT)

14

pm 975

(GAT3)

15

-pm 975 NO CPE

50 cells from control & pm 975. dl 1101/1101

the control off. NO contamination.

Maybe due to not changing mesh?

19

pm 975 (GAT)

EXHIBIT

15

Growing cells  
on coverslips  
for IF & CPE

HEL 299 cells

counted 1 dish = 188,000 cells (1:35 split)

① virus pm 925 pfu  $4.06 \times 10^{10}$

$$\text{for } 100 \text{ pfu} = \frac{100 \times 1.88 \times 10^4}{4.06 \times 10^2} = \frac{1.88}{4.06 \times 10^{-2}}$$

dilute the virus to  $10^9$  titer.  
50  $\mu$ l to 500  $\mu$ l serum free media

$\approx 4.6 \mu$ l

② virus dl 101/1107

$$= \frac{100 \times 1.88 \times 10^4}{1.95 \times 10^2} = \frac{1.88}{1.95 \times 10^{-2}}$$

dilute the virus to  $10^9$   
10  $\mu$ l to 1ml medium.

$\approx 9.6 \mu$ l

③ +ve control dl 309

$$= \frac{100 \times 1.88 \times 10^4}{2.15 \times 10^2} = \frac{1.88}{2.15 \times 10^{-2}}$$

dilute the virus to  $10^9$   
10  $\mu$ l to 1ml medium

$\approx 8.7 \mu$ l  
10  $\mu$ l

EXHIBIT  
Elc

# Growth arrested HEL 299<sup>P12</sup> cells P<sup>12</sup>

24 days

0	HEL 299 (Mock)	= 0
1	"	+1
2	"	-1
3	"	0
4	"	+1
5	"	-1
6	HEL 299 + dl 101/1107	= 0
7	"	+1
8	"	-1
9	↑	
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
	Growing cells	3 <sup>rd</sup> days
21	HEL 299 Mock	= 0
22	"	= +1
23	"	= -1
24	+ PM 125	=
25	"	
26	"	
27	dl 101/1107	
28	"	
29	"	
30	dl 309	
31	"	
32	"	
33	PM 975	
34	↓	
35		
36		
37	↓	

EXHIBIT

17

2/25/78

STAIN TESTS HELD

infected E d1101/1107

24th day

TRY 400 B+W

100

10/10/11

26

1-80

2-REA

4P

IV PUI

30/30

1-10/11

1

1-10/11

1

1-10/11

1

1

1

1	HEL 299 (mole)	= 0
2	"	+1
3	"	-1
4	"	0
5	"	+1
6	"	-1
7	HEL 299 + d1101/1107	= 0
8	"	+1
9	"	-1
10	"	0
11	"	+1
12	"	-1
13	"	0
14	"	+1
15	"	-1
16	"	0
17	"	+1
18	"	-1
19	"	0
20	"	+1
21	"	-1

print reads 0=1

Same

Growing cells 3rd day

Growing 21, 22, 23 mole

22	HEL 299 MOLE	= 0
23	"	+1
24	"	-1
25	+ PM 975	0
26	"	+1
27	"	-1
28	d1101	0
29	"	+1
30	"	-1
31	d1309	0
32	"	+1
33	"	-1
34	PM 975	= 0
35	"	+1
36	"	-1
37	"	1

Same

EXHIBIT  
IB

# Growth arrested HEL 299 cells

## Growth Curve:-

Count the cells: 347,000 cells

① 100 pfu = for dilution 10<sup>4</sup> =  $\frac{100 \times 347,000}{1.95 \times 10^4} = \frac{347}{1.95 \times 10^4} = 17.2$

dilute the virus to 10<sup>4</sup>  
10 ml to 1 ml

② 100 pfu for pm 975 =  $\frac{100 \times 347,000}{4.86 \times 10^4} = \frac{347}{4.86 \times 10^4} = 8.5$

dilute the virus to 10<sup>4</sup>  
50 ml to 500 ml

③ the concentration 1309 =  $\frac{100 \times 3.47 \times 10^5}{2.15 \times 10^4} = \frac{3.47}{2.15 \times 10^2} = 16.2$

dil to 10<sup>4</sup>  
10 ml to 1 ml

↓  
work  
infant  
EMEM 0.29 FCS

EXHIBIT

19

P111 photographs: T<sub>max</sub> 170 B/W

Growth arrested HEL299, 3 days

C	1	HEL299 - molar	= 0	
	2	"	+1	
	3	"	-1	
	4	"	0	
	5	"	+1	
	6	"	-1	
	7	+ pm 975	0	
	8	"	+1	
	9	"	-1	
	10	"	0	
	11	"	+1	
	12	"	-1	
	13	"	0	
	14	"	+1	
	15	"	-1	
	16	"	0	
	17	"	+1	
	18	"	-1	

pm 975, 3<sup>rd</sup> day, 6A

nucleus appears darker than control

↓ KAT-

EXHIBIT

420

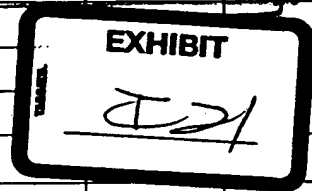
P IV  
in photos

Growing 9<sup>th</sup> day

Tmax 100

B/w. Prints

1	HEL 299 (Mock)	2 NCOJ	
2	"	H	
3	"	-1	
4	"	0	
5	"	+1	
6	"	-1	
7	dl 309	0	
8	"	+	
9	"	-1	CPE ✓
10	"	0	
11	"	+1	
12	"	-1	
13	pm 975	0	
14	"	+1	
15	"	-1	CPE ✓
16	"	0	
17	"	+1	
18	"	-1	
19	dl 1101	0	
20	"	+1	0 ?
21	"	-1	0
22	"	0	
23	"	+1	
24	"	-1	
Growth Arrested 5 <sup>th</sup> day			
25	HEL 299 Molk	0	
26	"	+1	
27	"	-1	
28	pm 975	0	
29	"	+1	
30	"	-1	CPE - NOT yet
31	"	0	NO CPE sign
32	"	+1	
33	"	-1	
34	dl 309	0	
35	"	+	shows - starting CPE
36	"	-1	
37	"	0 less light	



9/

# Photographs

Carl took 1-18 photos

Growth Arrested HEL 258 9th day

19 HEL 6A 0

20 " +1

22 " -1

22 PM925 0

23 " +1

24 " -1

25 " 0

26 " +

27 " -1

28 d1101 0

29 " +1

30 " -1

31 0

32 +

33 -1

34 d1309 0

35 " +

36 " -1

37 " 0

38 " +1?

NO CPE sign

NO CPE sign

Shows CPE

EXHIBIT

I22



P6

photos:

Tmax 100 black + white

Growth arrested HEL295 - 10<sup>th</sup> day.

1 HEL 299, GA, mock - 0

2 " " +1

3 " " -1

4 PM975 - 0

5 " " +1

6 " " -1

7 " " 0

8 " " +1

9 " " -1

10 dl 1101 / 1107 - 0

11 " " +1

12 " " -1

13 " " 0

14 " " +1

15 " " -1

16 dl 309 - 0

17 " " +1

18 " " -1

19 " " 0

20 " " +1

21 " " -1

ND CPE?

ND CPE

shows CPE - growing

Growing cells → 15 days

22 HEL 299, mock ± 0

23 " " ± 1

24 " " -1

25 PM975 - 0

26 " " +1

27 " " -1

28 dl 309 - 0

29 " " +1

30 " " -1

31 dl 1101 / 1107 0

32 " " +1

33 " " +1

34 dl 1101 / 1107 = 0

All the cells rounded & most of them floating (dead cells)

All the cells rounded & floating (dead)

Cells are larger, fewer, some cells have larger nuclei - CPE?

EXHIBIT

223

photographs 3<sup>rd</sup> day  
 Growing HEL 299 P<sup>17</sup>

1	HEL 299 G	2	0		
2	"		+1		
3	"		-1		
4	dl 309	100 pfn	0		
5	"		+1	100 pfn	~ 107 UPE
6	"		-1		
7	dl 309	500 pfn	0		
8	"		+1	500 pfn	~ 30 ?
9	"		-1		
10	pm 975	100 pfn	0		
11	"		+1		
12	"		-1		
13	"		0	100 pfn	~ 20 ?
14	"		+1		
15	"		-1		
16	pm 975	500 pfn	0		
17	"		+1		
18	"		-1	500 pfn	~ 91 ?
19	"		0		
20	"		+1		
21	"		-1		
22	dl 1101	100 pfn	0		
23	"		+1		
24	"		-1	100 pfn	NO UPE
25	"		0		
26	"		+1		
27	"		-1		
28	dl 1101	500 pfn	0		
29	"		+1		
30	"		-1	500 pfn	NO UPE
31	"		0		
32	"		+1		
33	"		-1		
34	HEL 299 control		0		
35	"		+1		
36	"		-1		

EXHIBIT  
 224

P<sup>2</sup> photographs

Growing 24 H days-

1	HEL 299.6	=	0	
2	"		+1	
3	"		-1	
4	"		0	
5	"		+1	
6	"		-1	
7	dl 1101/1107		0	
8	"		+1	
9	"		-1	skips (0)
10	"		0	
11	"		+1	
12	"		-1	
13	"		0	
14	"		+	
15	"		-	
<hr/>				
16	[GA] HEL 299	19 days		
17	HEL 299 GA	-	0	
18	"		+1	
19	"		-1	cells are dying
20	"		0	
21	"		+1	
22	"		-1	
23	pr 925		0	
24	"		+1	
25	"		-1	
26	"		0	
27	"		+1	
28	"		-1	
29	dl 1101/		0	
30	"		+1	
31	"		-1	
32	"		0	
33	"		+1	
34	HEL 299 C		-	
35	"		0	
36	"		+1	
	"		-1	

EXHIBIT  
P25

Expt 3 Growth arrested 299 cells p<sup>171</sup>  
Growth curve:-

Count the cells: 347,000 cells

① 100 pfr =  
for dilution 10<sup>4</sup>  

$$= \frac{100 \times 347,000}{1.95 \times 10^4} = \frac{347}{1.95 \times 10^4} = 17.0$$

dilute the virus to 10<sup>4</sup>  
100 ml to 1 ml

500 pfr = 85.0

② 100 pfr  
for pm 975  

$$= \frac{100 \times 347,000}{4.06 \times 10^4} = \frac{347}{4.06 \times 10^4} = 8.52$$

dilute the virus to 10<sup>4</sup>  
50 ml to 500 ml

500 pfr = 42.5 ml

③ the CNTR d1309  
dil to 10<sup>4</sup>  
10 ml to 1 ml  

$$= \frac{100 \times 347,000}{2.15 \times 10^4} = \frac{347}{2.15 \times 10^4} = 16.0$$

500 pfr = 80.0

EXHIBIT

826

↓  
wash  
infect

EMEM 0.2% FCS  
NO CPE

Days 1, 2 =

Days 3 =

d1 1101, pm 975, d1309. NO CPE / 100 pfr  
at 500 pfr, 2 pm 975 & d1309 shows  
beginning of CPE

Day 4 = NO CPE 1101/1107 (100 d 500 pfr)

Day 5 = NO CPE PM 975 (100 pfr)

= CPE begins pm 975 500 pfr only

Day 6 = NO CPE PM 975 100 pfr

Day 7 = NO CPE d1 1101/100 & 500 pfr

NO CPE d1309 100 pfr. CPE in d1309 500 pfr

3/10/97  
F

2/13/97

Growth Curve :- Frozen:- days

KEI-299

pm975, dl1101  
 Growing: 1,3,5,6,7, 1,3,5,6,7,10,15,19  
 GA: 3,5,7,10,14 5,7,10 19

GA  
 pm975 GA:  $\checkmark$  GA 3 = 14<sup>th</sup> day  
 $\checkmark$  GA 4 = 10<sup>th</sup> day  
~~GA 2 = 5<sup>th</sup> day~~  
 $\checkmark$  GA 7 = 19<sup>th</sup> day  
~~GA 1 = 3<sup>th</sup> day~~  
 Growing  
 $\checkmark$  GA 3 = 3<sup>rd</sup> day 67  
 $\checkmark$  GA 4 = 5<sup>th</sup> day  
 $\checkmark$  GA 6 = 6<sup>th</sup> day 64  
 $\checkmark$  GA 7 = 7<sup>th</sup> day

GA  
 dl 1101/1107 =  $\checkmark$  GA 7 = 19<sup>th</sup> day  
 $\checkmark$  GA 9 = 10<sup>th</sup> day  
 $\checkmark$  GA 2 = 5<sup>th</sup> day  
 $\checkmark$  GA 23 = 23<sup>rd</sup> day  
 Growing  
 G3 = 5<sup>th</sup> day  
 G24 = 15<sup>th</sup> day  
 G24 = 24<sup>th</sup> day

2/18/97

pm975: GA 10, 14, 19 day  
 Growing = 3, 5, 6, 17 day  
3 or 7?

EXHIBIT

227

# Growth Curve - Plaque assay:

293 cells:-

Growing = pm 975 : days 1, 3, 5, 6, 7

GA = pm 975 = 3, 5, 7, 10

#9

Growing = dl1101 = 1, 5, 7, 10, 15

GA = 7, 10

#7

dl309 =

Infections = 0.5 ml

0.1 ml

und

$10^{-2}$

$10^{-4}$

$10^{-5}$

DO pm 975 first  
# 7 points Growing =

5

= 5x

=

25 dish

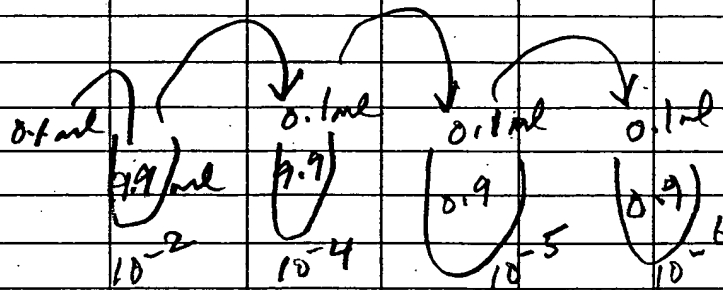
GA = 4

= 4x

=

20 dish

35



0.5 ml adsorption:  
1 ml  $10^{-2}$  to  $10^{-6}$

0.1 ml und

Stain on 2/24/97

EXHIBIT

228

dl 1101/1107 Growth Curve:  
plaque assay

dl 1101/1107

GA:

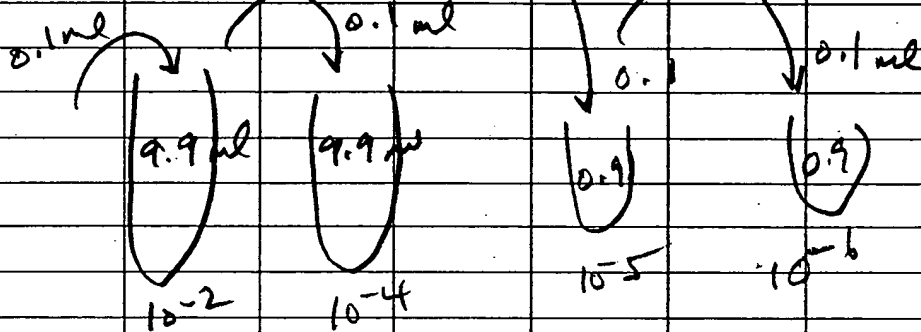
Day  
 GA7 = 19=  
 GA9 = 10  
 GA2 = 5  
 GA = 23

Growing

G3 = 5 hr  
 G4 = 15 hr day  
 G24 = 24 hr

GA3 part

Dilutions



↓  
 0.5 ml injection:

EXHIBIT

229

# Growth Curve

3/4/97

211201/1207

100 pfu

Growing

Small plaques

went out more day:-

$$G3 = 5^{\text{th}} \text{ day} = 1.4 \times 10^4$$

$$15^{\text{th}} \text{ day} = 152 = 406 / \text{ml} \times 10^2$$

$$= 4 \times 10^4$$

$$24^{\text{th}} \text{ day} = 10^{-4} \quad 66 / 0.5 \text{ ml}$$

$$132 / \text{ml}$$

$$= 132 \times 10^4$$

$$= 1.3 \times 10^6 / \text{ml}$$

G4

$$5^{\text{th}} \text{ day} = 1.1 \times 10^3 \text{ pfu/ml (No plaques in ud.)}$$

$$10^{\text{th}} \text{ day} = 7 \times 10^2 / 0.5 \text{ ml} = 14 \times 10^2$$

$$= 1.4 \times 10^3$$

$$19^{\text{th}} \text{ day} = 42 \text{ plaques} / 0.5 \text{ ml (Small)}$$

$$= 84 / \text{ml} \times 10^2$$

$$= 8.4 \times 10^3 \text{ pfu/ml}$$

$$23^{\text{th}} \text{ day} = 28 \times 10^2 / 0.5 \text{ ml}$$

$$= 56 \times 10^2$$

$$= 5.6 \times 10^3 \text{ pfu/ml}$$

EXHIBIT

230



# Growth Curve:

2-25-97

Growing	PM 975:	180 pfu	
<u>3<sup>rd</sup> day</u>	$10^{-6}$	<u>plaques</u> 71	pfu/ml $7.1 \times 10^7$
5 <sup>th</sup> day	$10^{-6}$	13	$1.3 \times 10^7$
6 <sup>th</sup> day	$10^{-6}$	11	$1.1 \times 10^7$
7 <sup>th</sup> day	$10^{-5}$	7	$7 \times 10^6$

<u>GA</u>			pfu/ml
10 <sup>th</sup> day	$10^{-4}$	12	$1.2 \times 10^5$
14 <sup>th</sup> day	$10^{-4}$	32	$3.2 \times 10^5$
19 <sup>th</sup> day	$10^{-4}$	18	$1.8 \times 10^5$

GA HEL 299 infected  $\bar{c}$  pm 975 did not CPE, but  
it gave viral yield  $\approx 10^4$

GA PM 975 is plaque assayed to day 2/25/97

EXHIBIT

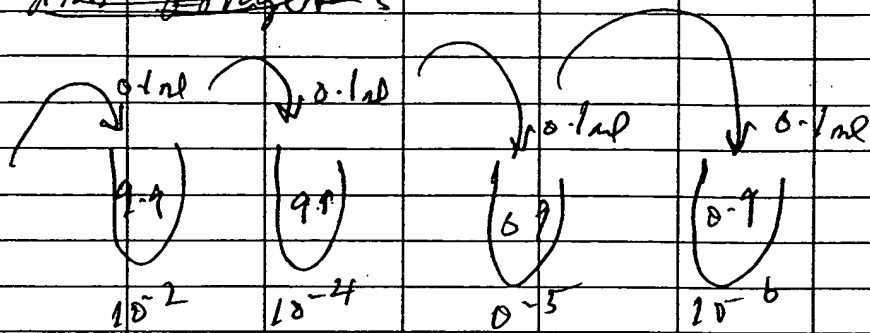
231

# Growth Curve:

3/5/97

pm 975. growing 1 + 3<sup>rd</sup> log.

~~1102~~ ~~6.10.97~~ 5<sup>th</sup>



EXHIBIT

732

# Growth Curve: plaque assay

11/12/15

Growing:

G1 day  
G2 (3 day)

d1 1101/1107  
" /

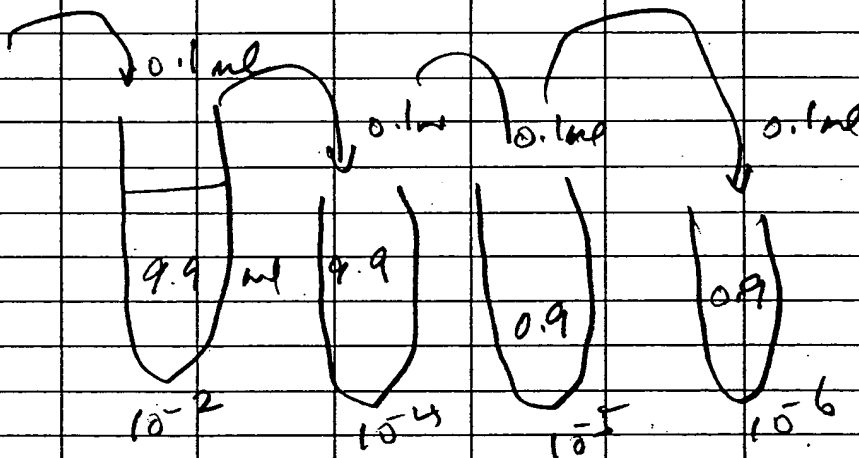
G1 d1 309  
G5 d1 309

GA = GAZ d1 1101/1107 ;

GAZ, d1 309  
GAS - d1 309  
day

7 viences ?

dilutions



0.5 ml

EXHIBIT

233

St. S. Grand: Amos  
867-6292  
782-1089  
989-2122

# Growth Curve.

3.12.97

Growing:

Day 1 (G2) <sup>PA 475</sup>

$4 \times 10^{-4}$  0.5ml

$4 \times 10^4 = 8 \times 10^4 / \text{ml}$

6<sup>th</sup> day infection

Day 3

$1.9 \times 10^{-5}$

$1 \times 10^{-6}$

$1.9 \times 10^6$

wait 2 more days.

0.5ml

$3.8 \times 10^6 / \text{ml}$

very small plaques.  
allow two more days to  
form more plaques.

$31 \times 10^6$  (counted after 2 days)

$3.1 \times 10^7$  PFU/ml

EXHIBIT

234

# Growth arrested

500 pfu

3/31/97

HEL 299 = # cells 351,000

1) for dil 1101/07  
dilute virus to  $10^7$   
(10  $\mu$ l to 1ml)

$$= \frac{5}{500} \times 351,000$$

$$= \frac{1.755 \times 10^4}{1.95 \times 10^4} = 90 \text{ ml}$$

2) for dil 309  
dilute the virus to  $10^7$   
(10  $\mu$ l to 1ml)

$$= \frac{5}{500} \times 351,000$$

$$= \frac{1.755 \times 10^4}{2.15 \times 10^4} = 81 \text{ ml}$$

↓ wash  
infect, remove,  
add EMEM + 0.2% FCS.

Freeze) 1 hour 3/31/97 ✓  
1 day  
6  
8  
15

EXHIBIT

735

# CPE Table

			Growing (100 pfu/cell)			HEL 299 - P <sup>17</sup>
			d1309	pm975	d1101/157	
Day						
1			-	-	-	
3			+	+	-	
5			+++	+++	-	
6			++++	++++	-	
7					-	
10					-	
15					±	(cell morphology changes)
24					++	
<u>Growth arrested</u>						
Day						
1			-	-	-	
3			±	-	-	
5			+	±	-	
9			++	-	-	
10			+++	-	-	
19				+	-	
24				±	-	

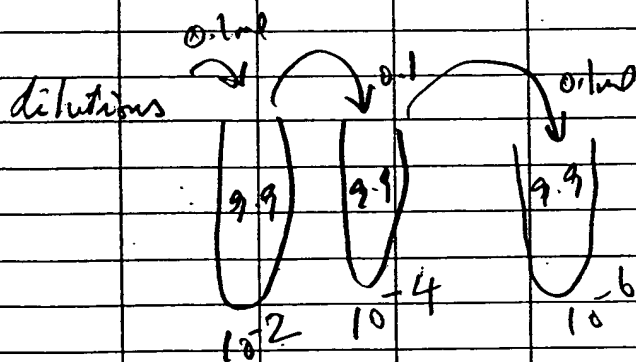
EXHIBIT

730

Titer: 253 cells d1 309 GA HEL 2X9

21/2/11

d1 309 GA: 500 pfu/ml



3h, 1d, 4, 6, 8 days.  
1 6 & 15

EXHIBIT

237

HEL 299 cells

5/15/97  
5/19/97

500 pfu/cell

Growing

d1309 d1101/07

3 hrs	$9 \times 10^3$	$2 \times 10^4$
1 day	$1 \times 10^4$	$4.2 \times 10^4$
4 "	$1.6 \times 10^4$	$1.2 \times 10^5$
8 "	$2.3 \times 10^4$	$1.4 \times 10^5$
10 "	$2 \times 10^6$	$2.4 \times 10^5$
15 "		$2.5 \times 10^5 \rightarrow 2.2 \times 10^6$
21 "		$3 \times 10^6 \rightarrow 4.6 \times 10^6$

Growth arrested:

3 hrs	$8.9 \times 10^3$	$4 \times 10^4$
1 day	$6.1 \times 10^4$	$4.4 \times 10^4$
4 "	$6.2 \times 10^5$	$4 \times 10^4$
8 "	$1.3 \times 10^6$	$5 \times 10^4$
10 "		$1.6 \times 10^4$
15 "	$5 \times 10^5$	$1.4 \times 10^4$
21 "		$2.2 \times 10^4$

$= 8 \times 10^3$

#4  
Mohan  
World Bank

EXHIBIT

738



7/12

① harvest  
flasks  
p150

Ad 1  
Ad 111  
Bailey

② freeze  
② 11-N-6  
11-Q - ⑥  
11-N - ③  
11-M - ③

split into (p100)

As49 m2 hygro (freeze)

m56-CrmA ② (Freeze + Split) (p100)

11.6.11 (split 1:3) just a bit too heavy

CrmA-11.6 ⑤ split / freeze

11.6-CrmA ⑨ split / freeze

Bring up m56-CrmA<sub>2</sub> to Flask

3. Harvest virus spinner

4. split other spinners

My Spinner:

-  $5.4 \times 10^5$  cells / ml

split 1/2 - freeze cells

-  $4.4 \times 10^5$  / ml / 1 liter removed  
and frozen

EXHIBIT

K1

8 - 100MM

7/13

todo

phone:

Ab in white / red File on Arms deck

Inventory virus book \* look / + check

✓ (KBS from freezer) / when brought up

3 day infection  
use first  
7001

Develop the gel (Monday)

$2 \times 10^5 / \text{ml}$

$7.5 \times 10^7$

✓ (cells frozen + thrown out)

no less than  $2 \times 10^5$   
3mls / 200mls cell

(loss virus / medium)

Ad 1 + Ad 6 (Virus stock) (5mls of stock)

set up  
1-100ml → stock

grow up

11.6 pre-absorbed

set up

293 cells from Kaye (Super 1) of  
Ginsberg-HSII (earliest stock) (175 flasks)

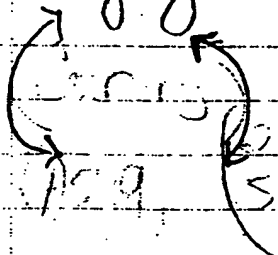
V5103 S-2-1 stock 50ml → 100mm plate → flasks

V5103 S-4-1 spin down / medium 2 x 10<sup>6</sup> FBS 100ml → 100mm plate

(harvested) (9.60725)

Bayley 11/07/6 (911003) 104-8 loc 50ml → 100mm plate

freeze thaw  
harvested (9.60725) 104-8



1. spinner 1 liter K.B.'s

Count  $3.4 \times 10^5$  cells/ml  
split 500ml into a 3 liter flask add 1.5 liter  
Joklik's media. Bring original 1 liter spinner  
up to 1 liter (Joklik's + 10% horse serum)

2. 3 liter spinner of K.B.'s infected

Count is  $3.2 \times 10^5$  cells/ml  
~~was~~ infect with (Baileys) 11/07/6 911003)

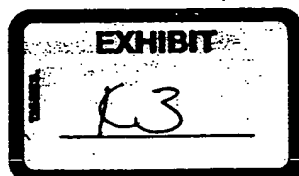
Baileys used was of a new stock grown up  
in 293 cells. last week Baileys 9600,  
(Titer unknown) infected at 11:30 → 12:30

used 20ml of virus into 1 liter of cells  
for 1 hour. then added back media  
(2 liters Joklik's + 100 ml denatured  
Horse serum)

3. develop gels.

4. split 293 give one plate to Ann. (split other cells)

5. look at plaques that are forming.  
very few new since yesterday  
count tomorrow.



1. Split 293, A549 in 60mm (dishes)
2. Bring 3 liter spinner up to add 1 liter  
Count.  $7.2 \times 10^5$

infect tomorrow w/ (704)

3. New media into all 56-29, 56-25, MSB-2MD,  
MSB-3MD, CMA-56-3, 11.6-1MD, 11.6 CMA-5 +  
A54911-Q

4. Harvest infected spinner; Bailey: wash  
pellet w/ PBS 2x (cold) resuspended it  
into 24mls total vol of .01 M Tris pH 8.0  
mls of cells + Tris = 24mls  
put into snap cap tubes & freeze at  
~~200~~ -70°  
put in freeze (right inside Lindas lab)

5. Split & freeze ~~200~~ - 500mls of KB back up  
spinner.

Backup  
p. Cells are not completely infected some  
are dying so must harvest cells

EXHIBIT

K4

CSC Banded the virus Ad1 960825  
1101/1107 Barleys (960825)

- 1 freeze (thaw)
- 2 sonicate x 2
- 3 Vol after son 1101 < 21mls

Ad1 < 19mls

add  $V \times 0.51 = g$  of GCL

10.71g in 1101/1107 Barleys  
9.69g w Ad1

infect 3 liter Spinner with  
dl 717 Vp 891208 Titer  $1.3 \times 10^{11}$

cell count 3 liter  $3.5 \times 10^5$   
Vol = 3 liters (3000mls)

$3.5 \times 10^5 \times 3000\text{mls} = 10.5 \times 10^8$  total  
cells

use 20 pfals / cell

$\frac{1.6 \text{ Qul} \times 10^5}{1.3 \times 10^{11}} \times 20 \text{ pfals}$

KB's are healthy no clumping

EXHIBIT

K5

Black (first)

960			9/25	Plaque Assay			Comment
	Ureus	Dil	A	B	C		
1.	1101/1107	$.5 \times 10^{-4}$	9	25	—		
(first infection)		$.5 \times 10^{-7}$	3	1	—		
		$.5 \times 10^{-8}$	Ø	Ø	Ø		
		$.5 \times 10^{-9}$	Ø	Ø	Ø		
		$.5 \times 10^{-10}$	Ø	Ø	Ø		
2	765	$.5 \times 10^{-4}$	TMTCA				
		$.5 \times 10^{-8}$	3	Ø	Ø		
		$.5 \times 10^{-9}$	Ø	Ø	Ø		
		$.5 \times 10^{-10}$	Ø	Ø	Ø		
3.	717	$.5 \times 10^{-8}$	Ø			Very hard to see plaques. today	
		$.5 \times 10^{-9}$	Ø	Ø	Ø		
		$.5 \times 10^{-10}$	Ø	Ø	Ø		

EXHIBIT  
KC

EXHIBIT  
K6

1101 / 1107	A	B	C	Comments
$.5 \times 10^6$ $.5 \times 10^7$ $.5 \times 10^8$ $.5 \times 10^9$ $.5 \times 10^{10}$	TMTCA 42 6 1 $\emptyset$	TMTCA 53 4 $\emptyset$ <del>53</del>	8 1 $\emptyset$	small plgs. (flat)
717	TMTCA TMTCA ← 34 1	28 3	36 3	hard to count because everywhere (very faint) very small
765	TMTCA 122 2 $\emptyset$	19 1 $\emptyset$	1 $\emptyset$	

EXHIBIT

K7

1101/1107	A	B	C	Comment
$1.5 \times 10^6$ $.5 \times 10^{-7}$ $.5 \times 10^8$ $.5 \times 10^8$ $.5 \times 10^{-10}$	TMTZ 9 14 <del>8</del> <del>8</del>	TMTZ 14 14 <del>8</del> <del>1</del>	12 <del>8</del> <del>8</del>	start off small grow very quickly
717				
$1.5 \times 10^{-6}$ $.5 \times 10^{-8}$ $1.5 \times 10^{-9}$ $.5 \times 10^{-10}$	TMTZ TMTZ 59 4	45 4	55 8	Very very small
765-				
$1.5 \times 10^{-6}$ $.5 \times 10^{-8}$ $1.5 \times 10^{-9}$ $.5 \times 10^{-10}$	TMTZ 9 2 1	11 3 8	3 monolayer strong	

EXHIBIT  
L8



5

1101/1107

$1.5 \times 10^6$   
 $.5 \times 10^{-7}$   
 $.5 \times 10^8$   
 $.5 \times 10^9$   
 $.5 \times 10^{10}$

A	B	C	Comment
TMTc all together hard	mold + TMTc to count		
5	7	2	
Ø	Ø	Ø	
Ø	Ø	Ø	

717

$1.5 \times 10^6$   
 $.5 \times 10^8$   
 $1.5 \times 10^9$   
 $.5 \times 10^{10}$

TMTc	-	-	small but visible
TMTc	TMTc	-	
14	13	7	
5	4	10	

765

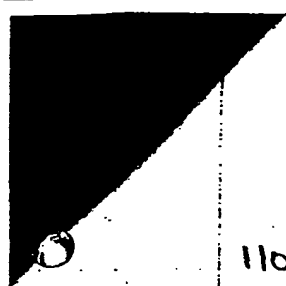
$1.5 \times 10^6$   
 $1.5 \times 10^8$   
 $1.5 \times 10^9$   
 $.5 \times 10^{10}$

TMTc	3	3
5	2	1
1	mold	
1		

0

EXHIBIT

K9



	A	B	C	Comment
1101/1107 1.5x10 <sup>6</sup> 1.5x10 <sup>-7</sup> 1.5x10 <sup>8</sup> 1.5x10 <sup>9</sup> 1.5x10 <sup>10</sup>	tmrc tmrc nonwaco Ø Ø	tmrc Ø Ø Ø	tmrc Ø Ø	
717 1.5x10 <sup>-6</sup> 1.5x10 <sup>-8</sup> 1.5x10 <sup>-9</sup> 1.5x10 <sup>-10</sup>	tmrc tmrc tmrc 3	tmrc tmrc Ø	tmrc 2	
765 1.5x10 <sup>-6</sup> 1.5x10 <sup>-8</sup> 1.5x10 <sup>-9</sup> 1.5x10 <sup>-10</sup>	tmrc Ø Ø Ø	2 Ø throw out	monolayer gene Ø	

EXHIBIT  
K10

1101/1107

$1.5 \times 10^6$   
 $.5 \times 10^{-7}$   
 $.5 \times 10^8$   
 $.5 \times 10^9$   
 $.5 \times 10^{10}$

A	B	C	Comment
TMTA			
7	2		
3	5	6	
Ø	Ø	Ø	
Ø	Ø	Ø	

Plg. Camp  
 up quickly  
 then taped  
 off.

717

$1.5 \times 10^{-6}$   
 $.5 \times 10^{-8}$   
 $1.5 \times 10^{-9}$   
 $.5 \times 10^{-10}$

TMTA	TMTA	
TMTA		
16	17	19
3	4	7

765

$1.5 \times 10^{-6}$   
 $1.5 \times 10^{-8}$   
 $1.5 \times 10^{-9}$   
 $1.5 \times 10^{-10}$

TMTA		
5	3	
1	Ø	Ø
Ø	Ø	Ø

EXHIBIT

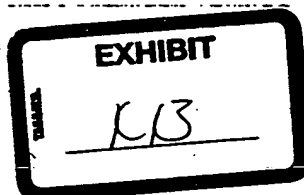
K11

	A	B	C	Comment
1101/1107				
$1.5 \times 10^6$	TMTc	TMTc	-	
$1.5 \times 10^7$	TMTc	TMTc	-	
$1.5 \times 10^8$	+1	+2	+0	
$1.5 \times 10^9$	+0	0	+0	
$1.5 \times 10^{10}$	0	<del>X</del>	0	
717				
$1.5 \times 10^6$	TMTc	-	-	
$1.5 \times 10^8$	TMTc	-	-	
$1.5 \times 10^9$	TMTc	→		
$1.5 \times 10^{10}$	+0			
		+2	+0	
765				
$1.5 \times 10^6$	TMTc	-	-	
$1.5 \times 10^8$	+1	+1	-	
$1.5 \times 10^9$	+0	+0	+0	
$1.5 \times 10^{10}$	+1	+0	-	

EXHIBIT

K12

1101/1107	A	B	C	Comment
$1.5 \times 10^6$ $.5 \times 10^{-7}$ $.5 \times 10^8$ $.5 \times 10^9$ $.5 \times 10^{-10}$	mold tmrc 5 $\emptyset$ $\emptyset$	$\pi$ 34 blended together tmrc 4 $\emptyset$ $\emptyset$	9 $\emptyset$ $\emptyset$	Really big
765 $1.5 \times 10^{-6}$ $.5 \times 10^{-8}$ $1.5 \times 10^{-9}$ $.5 \times 10^{-10}$	tmrc tmrc 4 $\emptyset$	3 $\emptyset$	12 $\emptyset$	monolayer looks bad no new just bigger
768 $1.5 \times 10^{-6}$ $1.5 \times 10^{-8}$ $1.5 \times 10^{-9}$ $1.5 \times 10^{-10}$	tmrc tmrc tmrc 3	tmrc tmrc $\emptyset$	2	



		A	B	C	comment
760	$.5 \times 10^{-8}$ $.5 \times 10^{-9}$ $.5 \times 10^{-10}$	TMTZ 37 3	TMTZ 29 1	TMTZ 26 4	
327	$.5 \times 10^{-8}$ $.5 \times 10^{-9}$ $.5 \times 10^{-10}$	TMTZ 60 18	TMTZ 74 17	74	
1101/1107	$.5 \times 10^{-6}$ $.5 \times 10^{-7}$ $.5 \times 10^{-8}$ $.5 \times 10^{-9}$ $.5 \times 10^{-10}$	TMTZ TMTZ TMTZ 66 8	TMTZ TMTZ TMTZ 64 7	70	Bg alpp
702	$.5 \times 10^{-8}$ $.5 \times 10^{-9}$ $.5 \times 10^{-10}$	TMTZ TMTZ 36	TMTZ TMTZ 30	TMTZ 36	

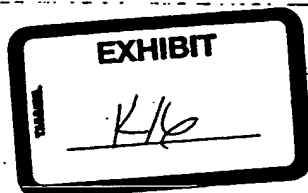


		A	B	C	comment
760	$.5 \times 10^{-8}$ $.5 \times 10^{-9}$ $.5 \times 10^{-10}$	TmTC 44 5	TmTC 40 4	TmTC 42 6	
327	$.5 \times 10^{-8}$ $.5 \times 10^{-9}$ $.5 \times 10^{-10}$	TmTC 64 <i>really TmTC</i> 18	TmTC 74 16	12 37 <i>Missed counting first time</i>	
1101/1107	$.5 \times 10^{-6}$ $.5 \times 10^{-7}$ $.5 \times 10^{-8}$ $.5 \times 10^{-9}$ $.5 \times 10^{-10}$	TmTC TmTC TmTC 25 11	<hr/> 21 9	22	<i>mid rice plg.</i>
702	$.5 \times 10^{-8}$ $.5 \times 10^{-9}$ $.5 \times 10^{-10}$	TmTC <del>21</del> <i>almost TmTC</i> 15	TmTC 24 14	22 15	

EXHIBIT

K15

		A	B	C	Comment
760	$.5 \times 10^{-8}$ $.5 \times 10^{-9}$ $.5 \times 10^{-10}$	TMTc 10 1	TMTc 20 3	TMTc 15 1	small
327	$.5 \times 10^{-8}$ $.5 \times 10^{-9}$ $.5 \times 10^{-10}$	TMTc TMTc 10	TMTc TMTc 8	TMTc TMTc 9	
1101/1107	$.5 \times 10^{-6}$ $.5 \times 10^{-7}$ $.5 \times 10^{-8}$ $.5 \times 10^{-9}$ $.5 \times 10^{-10}$	TMTc TMTc TMTc 4 0	— TMTc TMTc 5 0	4 —	
702	$.5 \times 10^{-8}$ $.5 \times 10^{-9}$ $.5 \times 10^{-10}$	TMTc TMTc 3	TMTc 3	5	





760

$1.5 \times 10^{-8}$   
 $1.5 \times 10^{-9}$   
 $1.5 \times 10^{-10}$

A  
 TMTCA  
 TMTCA  
 4

B  
 TMTCA  
 TMTCA  
 3

C  
 3  
 1

Common  
 Very small easy to count.

327

$1.5 \times 10^{-8}$   
 $1.5 \times 10^{-9}$   
 $1.5 \times 10^{-10}$

TMTCA  
 TMTCA  
 3

TMTCA  
 TMTCA  
 5

—  
 TMTCA  
 6

1101/1107

$1.5 \times 10^{-6}$   
 $1.5 \times 10^{-7}$   
 $1.5 \times 10^{-8}$   
 $1.5 \times 10^{-9}$   
 $1.5 \times 10^{-10}$

TMTCA  
 TMTCA  
 TMTCA  
 0  
 2

—  
 TMTCA  
 TMTCA  
 1  
 1

0  
 0

Very acidic

702

$1.5 \times 10^{-8}$   
 $1.5 \times 10^{-9}$   
 $1.5 \times 10^{-10}$

TMTCA  
 TMTCA  
 1

TMTCA  
 0

TMTCA  
 1

Very close hard to count

EXHIBIT

147

760

$1.5 \times 10^{-8}$   
 $1.5 \times 10^{-9}$   
 $1.5 \times 10^{-10}$

A  
 TMCA  
 TMCA  
 3

B  
 TMCA  
 TMCA  
 2

C  
 2

common

327

$1.5 \times 10^{-8}$   
 $1.5 \times 10^{-9}$   
 $1.5 \times 10^{-10}$

TMCA  
 TMCA  
 8

TMCA  
 TMCA  
 5

TMCA  
 2

110/1107

$1.5 \times 10^{-6}$   
 $1.5 \times 10^{-7}$   
 $1.5 \times 10^{-8}$   
 $1.5 \times 10^{-9}$   
 $1.5 \times 10^{-10}$

$\emptyset$   $\emptyset$   $\emptyset$

all plates too acid no new colony

702

$1.5 \times 10^{-8}$   
 $1.5 \times 10^{-9}$   
 $1.5 \times 10^{-10}$

TMCA (throw out)  
 TMCA  
 $\emptyset$

TMCA  
 $\emptyset$

TMCA  
 $\emptyset$

throw out

Keep plates  $5 \times 10^{-10}$  760, 327  
 still growing plasm

EXHIBIT  
 K18

		Plaque Assays (% of final plaque #)							
Virus		5d	7d	12d	13d	16d	19d	25d	30d
①	1101/1107	0.	18.3	55.	67.9	80.7	80.7	83.5	100.9%
②	sub 765	2.6	32.8	57.8	65.5	79.3	81.	83.6	100.
③	dl 717	0.	10.3	33.8	54.4	82.4	89.7	92.6	100.

titer of 1101/1107 :  $6.61 \times 10^9$  /ml

(harvested from KB cells at day 2)

		10-15-96 Plaque Assays (% of final plaque #)				
Virus		8d	10d	13d	16d	21d
①	pm 760	32.4	78.	94.2	97.7	100.9%
②	dl 327	32.1	65.4	82.1	90.7	100.
③	dl 1101/1107	65.7	94.6	98.7	100.	100.
④	dl 702	64.2	91.8	98.7	100.	100.

titer of 1101/1107 :  $1.95 \times 10^{11}$  pfu/ml

(harvested from KB cells at day 3)

EXHIBIT

K19

	Virus	From	INF	Harvest	Spin	Plag	Comments	Freezer
1	Ad4ΔPRK	(VS58)	961016	961018 ✓				
2	Ad4ΔE <sub>3</sub>	(96103)	961104	961106				
3	Ad4ΔE <sub>3</sub> B	(VS56)	961031	961102				
4	1101/1107	(Anileys)	960905	960907	✓	✓		1-1
5	1101/1107	2nd batch	960917	960919	✓	✓		1-1
6	d1702	(VS33)	961002	V2day	✓	✓		1-2
7	d1773	(VS230)	960909	V2day	✓			101-5
8	d1717	(VS118)	960906	960908	✓	✓		2-2
9	327	(VS212)	960914	960917	✓	✓		5-5
10	ΔM160	(VS227)	960915	960917	✓	✓		4-6
11	Ad5	(VS198)	960907	960908	✓	✓	Great bands	101-2
12	Ad1	(sup)	960905	960907	✓	✓		2-1
13	d1762	(Repeat)	961018	961018	✓	✓	Bad no plagues	2-3
14	Ad11	Sup	961030	961002				
15	dL797	(VS243)	961021	961024				
16	Ad3						first spin	
17	Ad6	SUP	960821	960803	✓	✓	Good bands	101-2
18	Ad9	(sup)	970209					
19	dL703	VS50	961001	961003	✓			
20	dL704	(VS167)	960802	960804	✓	✓	thin bands	5-2
21	dL748	(VS181)	960708	960810	✓	✓		13-6
22	dL798	(VS188)	960708	960710	✓	✓	Good	13-4
23	dL763	(VS214)	960703	960705	✓	✓	Bad bands look good	2-3
24	dL765	(VS225)	960824	960826	✓	✓		101-8
25	dL739	(VS223)	961023	just plg	✓	✓		
26	dL754	(VS243)	961002	just plg	✓	✓		
27	dL712	?	950503	—	✓	✓	Plays good	
28	7001	?	960724	960726	✓	✓		
29	dL250	sup	950616	950618	✓	✓	Big plagues/nice bands	
30	Ad41	Sup/293	(293)	→				
31	Ad40	Sup/293	(293)	→				
32	Ad707	(VS123)	961008	961110				
33	dL740	VS240	960612					
34	dL728	(Repeat)	961020	961122				
35	Ad15	961021	970305		✓			
36	Ad15		970205	970205	✓	✓	Great bands	
37	Ad15		970215	970215	✓	✓	Great "!"	

EXHIBIT

K20

8/20/87  
8/20/87 40620 see page

4/62  
Chris

Low affinity Nerve growth receptor = .1 ug / ul

Viruses from Kostaya: grown in KB's first AB49  
then KB.

= Viruses from Bowling - grown in AB49 first then  
then in KB! 2 flasks

Set up 2 flasks for bowling virus. pmt 11.6  
AAA

= KB's ready to infect in 3 liter spinner  
counts

1 liter bring up to 1300 liters split  
tomorrow.

707:  $1.57 \times 10^{10}$

count  $3.8 \times 10^5 \times 9.9 \times 10^8$  cells / liter

$$\frac{9.9 \times 10^8}{1.57 \times 10^{10}} \times 10 \text{ pfu's} = 63 \text{ ul}$$
$$\frac{9.9 \times 10^8}{1.57 \times 10^{10}} \times 5 \text{ pfu's} = 315$$

Infect.

EXHIBIT

K21

4/28/monday

1. set up AS49 for virus from Costag
2. split MCF-7 for transfection of  
Nerve growth factor.
3. change media on MCF-7 - transfections  
11.6 - MCF-7 ~ 5-6 clones per dish  
MS6 - MCF-7 ~ 3-4 " "  
except for one dish which has alot more

thus:

set up transfection w/  
low affinity Nerve growth factor

= 3 dishes  
+ 11.6 = 3 dishes  
2 controls

use new prep.

EXHIBIT

K22

Coverslips of mcf-7.

ishes Affinity Nerve growth factor .2 ug/ul  
use.

Solution

$$A = (PK \log FRMN) \cdot 2 \text{ ug/ul} = 25 \text{ ul/dish}$$

NGF ONLY

3 NGF only

A = 75ul DNA + 800ul opti DMEM =

B = 36ul lip + 300ul opti DMEM

A+B for 30min 2.4 ml opti

NGF + 11.6

A 5.17 11.6 + 75ul + 300ul opti DMEM

B 36ul lip + 300ul opti DMEM

A+B for 30min 2.4 ml opti

2 dishes not transfected = for control

- mix A+B let sit R.T for 30min, Add Raman-nuclein
- 1ml per dish / for five hours,
- then add 20% media (1ml) let incubate O/N
- stain tomorrow.

1 dish pMT2 2.2 + 100 opti DMEM

12 lip + 100 opti DMEM

Add 1ml 20% on transfection / Add 2% to infection

Set up Plastro 293 (110 virus)

Set up 4 A549 plates 100ul to pre absorb ab

Add ~~the~~ Costas Virus to flasks - put split & B's

EXHIBIT

1623

5/2 Friday

- Freeze FAS cells - pool
- V infection
- split all cells /
- split KB's back

5/8 - split ASIA to two flasks - for Koshya  
- clones picked  
- infect the other ~~spinner~~

$$4.5 \times 10^5 \text{ cells/ml} / \times 3000 \text{ nls} =$$

13,500 cells.

cells look ok: added 5mls of  
the virus 45.5 from Koshya to  
the spinner

(tomorrow pick clones.)  
get cells from Mohan  
make Jakl's media / ok

*WV*





1:30

5/B

797?

freeze + thaw + spn to CS prep  
viruses

20 nls

19 nls

20 nls

19 nls

KD-1 1101/1107 App 970508

PME 11.6 AAA 970508

all 707 970423

all 751 970324

Viruses in warm room X2 thaw.

~~vitamin C~~ also

20 nls

all 707 970315

2/2

2/2

split Asta cells to Flasks for 797 + others  
listed.

IN Freezer, need some cells in beater

location

PME = 1, 7

KD = 9, 3

751 = 11, 5

707 (970315) 8, 2

707 = 6, 12

set machine on  
4° / 35K for  
O/N ↔

EXHIBIT

K25

5/14

Viruses taken out of Centrifuge

(970508) <sup>(45-47)</sup> KD-1 (Kostya) 1101/1107 ADP: <sup>harvest</sup> ~ 4 mls (small thin bands)  
(970324) dl 751 (nice thick bands) good = ~ 4 mls  
(970315) dl 707 (very thick by bands great) = ~ 9 mls  
(970423) dl 707 (nice bands) good = ~ 6 mls

(970503) DME-11.6 AAA (very nice bands) good ~ 5 mls/3  
(BLY ADP-AAA)

Note Don't dilute KD-1 very much got a lot of extra liquid w/ viruses band ~ 2 mls of actual virus.

Dilute with TSB ~ 5x-10x

	tubes	LOC
KD-1 dilute bring up to (10 mls)	5	4-4
dl 751 bring up to (16 mls)	8	2-5
dl 707 (970315) bring up to (24 mls)	12	4-3
dl 707 (970423) bring up to (16 mls)	8	4-3
DME-11.6 AAA = bring up to (14 mls)	7	4-4
BLY (ADP-AAA)		

(plaque assay viruses) 751 original 53-3/60-B  
one tube of each in my box to plaque 707 original

need to

infected  
3

3 tubes w/

HS dl 111

HS dl 112

dl 205

sup from

flasks

AS49

EXHIBIT

K26

5/20/97

Waco assay (Titer virus)

751 (970324)

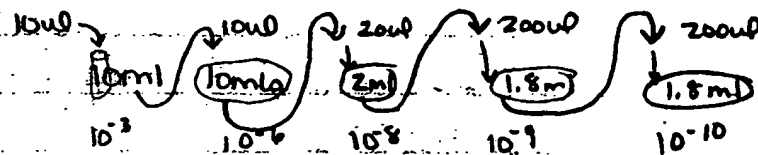
dl 707 (870315)

dl 707 (970423)

DMG-11.6 AAP (BLY-ADP-AAP) (970503)

KD-1 (970508) (Kostya)

dilute all viruses 10uL to 10mls ( $10^{-3}$  dilution)



45

65

2 -  $10^{-8}$

3 -  $10^{-9}$

3 -  $10^{-10}$

\* each

50  
5  
2  
1  
43

100mls 2x DME  
10mls Sodium Bi  
4mls FBS  
2mls Glut  
8mls AGAR

Add virus to the 3liter spinner — dl 110 virus

3liter Count:  $4.2 \times 10^5$  cells/ml. use 1ml cells.  
20110

1 liter Count:  $(2.7 \times 10^5 \text{ cells/ml})$  split...

EXHIBIT

K27

6/2

Grand 7/23							
	A	B	C		A	B	C
$5 \times 10^{-8}$	TMT	TMT	/		TMT	TMT	
$5 \times 10^{-9}$	10	back	10		9	3	10
$5 \times 10^{-10}$	2	✓	1		3	✓	✓
707	$5 \times 10^{-8}$	14	15	/	68	47	
(110)	$5 \times 10^{-9}$	(2)	5	2	8	2	✓
7/23	$5 \times 10^{-10}$	✓	✓	✓	✓	✓	✓
707	$5 \times 10^{-8}$	13	15	/	30	17	
	$5 \times 10^{-9}$	3	✓	✓	2	3	✓
	$5 \times 10^{-10}$	✓	✓	3	✓	✓	✓
KD-7	$5 \times 10^{-8}$	Total 162	163	Total 162	TMT	TMT	
	$5 \times 10^{-9}$	Total 46	49	Total 46	3	1	1
	$5 \times 10^{-10}$	1	✓	✓	1	✓	2
PMF	$5 \times 10^{-8}$	74	78	/	TMT	TMT	
(nucsu preqs)	$5 \times 10^{-9}$	16	11	28	12	14	7
	$5 \times 10^{-10}$	4	3	2	1	✓	2

$8.1 \times 10^9$

EXHIBIT  
K28

W138 infections with

1101/1107 and d1308

11/24

MOI

dividing

quiescent

549

0.1

1

10

100

16 35 mm W138

8 35 mm A549  $2.5 \times 10^5$  cells/dish

infections 11/25

A549  $2.5 \times 10^5$  cells

$5 \times 10^4$  0.1

$5 \times 10^5$  1

$5 \times 10^6$  10

$5 \times 10^7$  100

MOI

$1.34 \times 10^6$   
1101/107 (960917)  
 $3.8 \times 10^5$

$3.8 \times 10^2$

10x dil 6x

~~11/107~~  
~~312~~  
~~6x10^2~~  
~~6x10^2~~

change medium on W138 to 0.2% FCS

11/22 infect started W138 with

d308 (950511)

100

10

MOI

1

0.1

1101/1107 (910917)

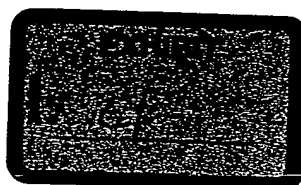
100

10

MOI

1

0.1



# ADP Western

infect A549 with 303, KDI 12/9

$10^6$  cells / dish  $8.08 \times 10^4$  / ml  $303 \Rightarrow 8.08 \times 10^4$  / ml  
 $50 \mu\text{g}/\text{cell} \Rightarrow 6.8 \mu\text{l}$

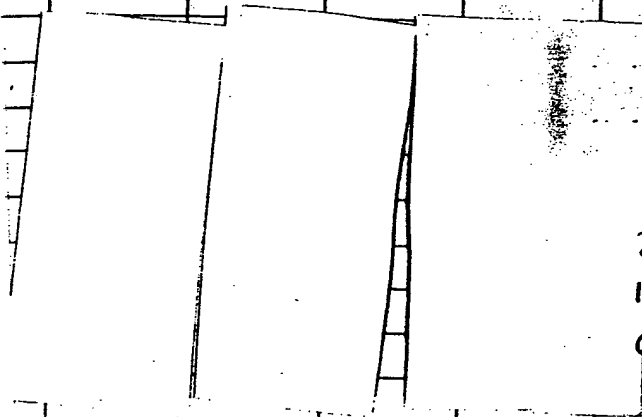
$6.12 \times 10^5$  / ml  $\text{KDI} \Rightarrow 6.12 \times 10^5$  / ml

$50 \mu\text{g}/\text{cell} \Rightarrow 8.16 \mu\text{l}$

Harvest 33h p.i.

$\phi$	0.190		
mark	0.280	100	5 $\mu\text{l}$
303	0.359	173	2.8 $\mu\text{l}$
KDI	0.320	140	3.6 $\mu\text{l}$

4



10 and 15% SDS PAGE

[mark, 303, KDI] 3X, BR

house/ mark 12.5 10%, 456/5%

block 10% milk OV

cut 12 ab

4 12522 II  
 5 12531  
 6 100578

1:400

mark

2nd ab

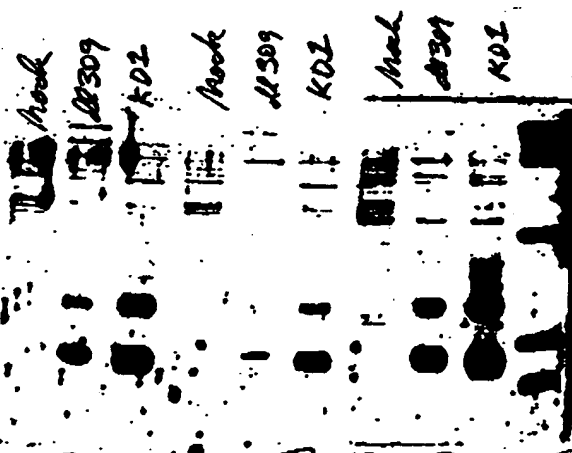
Wash

3X rabbit HRP

3X



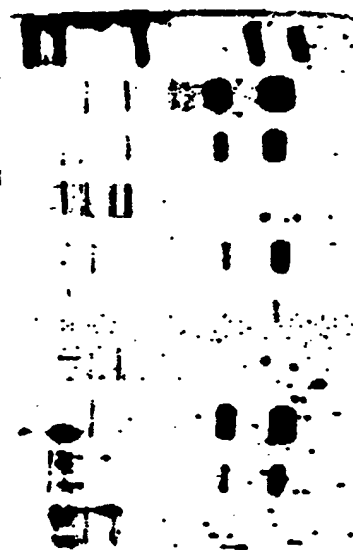
- KD1 expressed Ad5 Ab well  
 - Can detect ADP by Western  
 - Prelim - looks like KD1 expresses more ADP than 301?  
 Used 500 PPM of KD1  
 Used 50 PPM of KD1



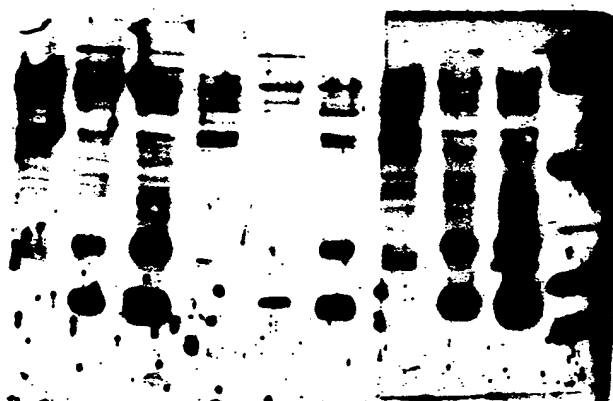
ADP Western 3rd h post  
 KD1  
 KD2  
 KD3  
 1101/1107  
 Not sept - Time course

ADP -  
 ADP -

3 diff antibodies  
 12532E  
 12531  
 100574  
 100 dilution  
 Use this



12/12/87



1001

309

mod

1001

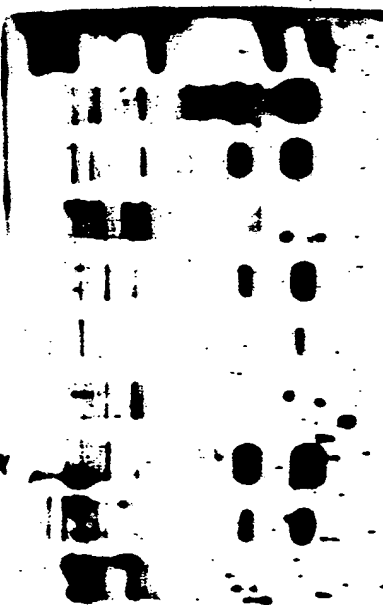
309

mod

1001

309

mod

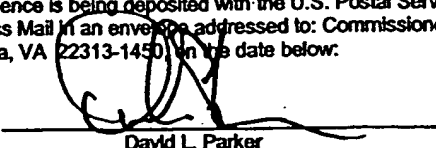


1005H

1005H

1005H



CERTIFICATE OF MAILING 37 C.F.R. 1.8	
I hereby certify that this correspondence is being deposited with the U.S. Postal Service with sufficient postage as First Class Mail in an envelope addressed to: Commissioner for Patents, P. O. Box 1450, Alexandria, VA 22313-1450, on the date below:	
12/3/03 November 12, 2003 Date	 David L. Parker

**PATENT**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re Application of:  
Wold *et al.*

Serial No.: 09/351,778

Filed: July 12, 1999

For: Replication Competent Anti-Cancer Vectors

Group Art Unit: 1632

Examiner: Priebe, Scott David

Atty. Dkt. No.: 66153-7775

**SUPPLEMENTAL DECLARATION OF THE INVENTORS UNDER 37 C.F.R §1.131**

We, William S.M. Wold, Ann E. Tollefson, Konstantin Doronin and Karoly Toth, declare as follows:

1. We are joint inventors of the subject matter claimed in the referenced patent application. We are submitting the present §131 declaration to supplement our earlier declaration filed January 6, 2003, the contents of which are incorporated herein by reference.
2. In our earlier declaration we demonstrated that the adenovirus vector KD1 was constructed prior to March 3, 1997, and, in numerous studies that we conducted between 5/9/97 and 6/2/97, KD1 was shown to overexpress ADP. We are submitting the present Supplemental Declaration to supplement our earlier declarations by demonstrating that (1) prior to March 3, 1997, we conceived of using ADP-expressing adenoviral vectors for treating cancer in patients,

and that (2) shortly after March 3, 1997 an exemplary vector, KD1, was tested in an animal having cancer and shown to have anticancer activity.

3. Prior to March 3, 1997 we conceived of the idea of using adenovirus vectors expressing the ADP gene as a therapeutic agent to treat cancer. This is shown, for example, in the exhibits to our 1/6/03 declaration, in particular, Exhibit B at, for example, page 3, section B, and pages 4-8. The Exhibit B document is dated prior to March 3, 1997.

4. On July 7, 1997, we sent KD1, dl1101/1107, dl309, and A549 cells to Dr. Jeffrey A. Whitsett at the Children's Hospital Medical Center, Division of Pulmonary Biology, Cincinnati, OH. A copy of the cover letter sent to Dr. Whitsett is attached as Exhibit M. Dr. Whitsett had agreed to test these vectors on our behalf in the A549 nude mouse model, in which A549 human lung carcinoma cells are used to establish tumors in nude mice following by injection of the various vectors to determine their anticancer efficacy. On September 16, 1997, we received a report from Dr. Whitsett's colleague, Lee Zhang, indicating that "10<sup>9</sup> pfu of each of the viruses were injected into each established A549 tumor. 4 out of 6 tumors injected with KD1 showed slowed tumor growth while 2 out of 2 tumors injected with dl309 and 4 out of 4 injected with dl 1101/1107 continued to grow." A copy of this fax is attached as Exhibit N.

5. Accordingly, foregoing studies conducted on our behalf demonstrated the successful use of KD1 in the treatment of cancer in an animal at least as early as September, 1997.

6. We hereby declare that all statements made of our own knowledge are true and all statements made on information are believed to be true and further that the statements were made with the knowledge that willful false statements and the like so made are punishable by fine or

imprisonment or both under § 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of this application or any patent issued thereon.

December 1, 2003  
Date

William S.M. Wold  
William S.M. Wold

December 1, 2003  
Date

Ann E. Tollefson  
Ann E. Tollefson

December 1, 2003  
Date

Konstantin Doronin  
Konstantin Doronin

December 1, 2003  
Date

Karoly Toth  
Karoly Toth



SAINT LOUIS UNIVERSITY  
HEALTH SCIENCES CENTER

SCHOOL OF MEDICINE

1402 S. Grand Blvd.  
St. Louis, MO 63104  
314/677-8435  
FAX 314/773-3403

Department of Molecular  
Microbiology & Immunology

William S. M. Wold, Ph.D.  
Professor and Chairman

7/8/97

Dear Jeff:

- Please find enclosed:

dl309,  $2.15 \times 10^8$  PFU/ml, ~ 200  $\mu$ l

dl1101/1107,  $1.95 \times 10^8$  PFU/ml, 2 ml

KD2,  $9 \times 10^{10}$  PFU/ml, 2 ml

A549 cells, passage 75.

- dl309 is Ad5, with the E3 10.4k, 14.5k, 14.7k genes <sup>deleted</sup>
- dl1101/1107, deletes the RB and p300 binding sites required to drive cells from G<sub>0</sub>  $\rightarrow$  S phase, in dl309 <sup>background</sup>
- KD2, is in dl1101/1107 background.  
Lacks all E3 (stealth) genes. Engineered to overexpress the Adenovirus Death Protein (ADP).

- Bill

FAX MESSAGE

DATE 9/16/97

TO

Name Bill Wald  
Address \_\_\_\_\_

Fax Number 314 413 3403 Phone Number \_\_\_\_\_  
Number of pages (including this one) 1

MESSAGE: 10<sup>7</sup> pfu of adenovirus were injected into each  
established R49 tumor. 4 out of 6 tumors injected  
with KD1 showed slowed tumor growth while 2 out of  
9 tumors injected with dl309 and 4 out of 4 injected  
with dl 1101/1107 continued to grow.

FROM

Name Lee Zhang

CHILDREN'S HOSPITAL MEDICAL CENTER  
DIVISION OF NEONATOLOGY  
3333 Burnet Avenue  
Cincinnati, Ohio 45229-3039  
Phone (513) 636-7992  
Fax (513) 636-7968

**TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING**

Docket Number (Optional)

**REJECTION OVER A PRIOR PATENT**

INGN:109US

In re Application of William S. M. Wold, et al.

Application No.: 09/351,778

Filed: July 12, 1999

For: REPLICATION COMPETENT ANTI-CANCER VECTORS

The owner\*, Saint Louis University, of 100 percent interest in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application, which would extend beyond the expiration date of the full statutory term defined in 35 U.S.C. 154 and 173, as presently shortened by any terminal disclaimer, of prior Patent No. 6,627,190. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the prior patent are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, the owner does not disclaim the terminal part of any patent granted on the instant application that would extend to the expiration date of the full statutory term as defined in 35 U.S.C. 154 and 173 of the prior patent, as presently shortened by any terminal disclaimer, in the event that it later: expires for failure to pay a maintenance fee, is held unenforceable, is found invalid by a court of competent jurisdiction, is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321, has all claims canceled by a reexamination certificate, is reissued, or is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer.

Check either box 1 or 2 below, if appropriate.

1. ☐ For submissions on behalf of an organization (e.g., corporation, partnership, university, government agency, etc.), the undersigned is empowered to act on behalf of the organization.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

2. ☒ The undersigned is an attorney or agent of record.

Monica A. De La Paz  
Signature

11/03/2004

Date

Monica A. De La Paz, Reg. No. 54,662  
Typed or printed name

(512) 536-5639  
Telephone Number

- ☒ Terminal disclaimer fee under 37 CFR 1.20(d) included.

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This collection of information is required by 37 CFR 1.321. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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